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GAS JOURNAL

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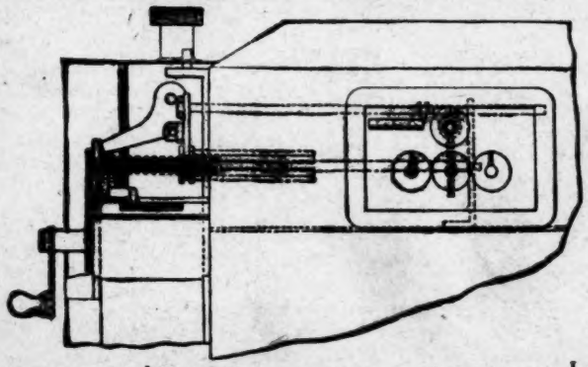

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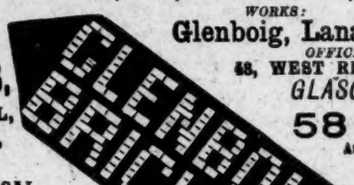

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VOL. CXLI., No. 2860.] TUESDAY, MARCH 5, 1918. [70TH YEAR.

EDITORIAL NOTES.

Inert Material and Impurities in Coal—An Appeal.

THROUGH private channels, at meetings of gas companies, and through our columns, the question of the increased quantity of inert material and other impurities now being dispatched from collieries with coal has been hammered at with insistence, in view of its seriousness, through the waste and loss of efficiency that in every direction are being imposed upon the country owing to the defective condition. But although it was known that the Coal Controller (Mr. Guy Calthrop) had expressed sympathy with, and had sought evidence from, some of the chief victims of coal uncleanliness, there were not visible any deliberate steps for the mending of matters. People were beginning to ask themselves why, if coal mines control was an actuality, some remedy could not be applied to a condition that was a detail of working, and a detail which meant labour, transport, and money saving to the country. But we are glad to learn that the subject has not been neglected at the Coal Controller's office. The expert advisers of the Coal Controller associated with utility undertakings and steam-raising—Mr. Thomas Glover, for the gas industry, among the rest—have had complete knowledge as to the heavy weight of national and industrial disadvantage that there was against any local advantage at the mines in sending-out coal that progressively with time showed an increased content of rubbish and impurity. At the periodical conferences of expert advisers, the matter has been kept well to the fore, has been discussed up and down, and has had its gravity impressed again and again. But the degree to which useless and injurious material has taken the place of its antithesis has amounted to nothing short of a scandal, and a great deal could be said about it that at the moment perhaps would be out of place, with a definite, though all too long-deferred, movement being made to secure improvement.

The Coal Controller is now taking measures of a persuasive character, in the hope that official suggestion will have some good correcting effect. There is no question of compulsion, but an appeal to good sense, patriotism, and consideration of national interests. The appeal has been made by letters addressed by Mr. Calthrop to the general managers of colliery companies and to the secretaries of the district miners' federations, calling their attention to the complaints of excess of ash, useless materials, and impurities—excesses representing variously 10 to 20 p.ct. from the normal—pointing out the serious national importance of this, and inviting vigorous co-operation henceforth in getting coal in as clean a condition as possible. It is earnestly hoped that the appeal will not fall on deaf ears, but that it will have a good response; so that the country, through its industries especially, will soon show that steps are being retraced from the degradation of economy and efficiency that has occurred through this lapse from the path of virtue in respect of reasonably clean coal. Such return to better conditions will increase for useful purpose transport capacity by sea and rail (the vital necessity of which is day by day deepening), as well as remove some of the avoidable weight of difficulty from industries already working at high pressure, by permitting them to operate with greater efficiency and without the loss of labour entailed by handling useless material, and by having to clear away an excessive output of clinker and other refuse. We cannot overlook the fact that these aspects of the matter have been time and again pressed upon the collieries by their large customers, but without effect; and as to the miners, they must see, now that the matter is being brought before them, that all the loss of transport capacity and the debasement of industrial efficiency occasioned by the lower quality of the fuel supplies sent away from the pits help to inflict additional hardship on the working people of the country who are in less fortunate circumstances than themselves. To the patriotism of all of them, and on the ground of national importance (to say nothing of honesty), the Coal Controller appeals for an early improvement in the quality of supplies. We hope there will be good voluntary response; for no one wants to see compulsion applied to a matter which can be rectified by the mere exercise of will and co-operation at the pits themselves.

There will be careful watch for the improvement that it is to be hoped will issue from the appeal. Mr. Wilson in connection with the steam-raising side and Mr. Glover in connection with the gas industry will periodically obtain samples of coal deliveries, as well as the evidence of experiences of users, to judge of the character of the response. Prior to this appeal, there have been communications passing with collieries from which coal has been sent containing some of the higher excesses of inert materials and impurities; and we know that, as a result, some improvement is happily being reported by certain works. On the other hand, there are works the engineers of which report that they have had comparatively little of which to complain until the last few weeks, during which, however, there has been a grievous falling away in the quality of their deliveries. We hope their bad experiences will be of but short duration, and that there will be reports from now that the cause of complaint is a progressively diminishing quantity.

Men for the Future Work of the Industry.

ONE of the perceptive men of the gas industry is Mr. J. P. Leather, of Burnley; and we are glad that he, by turning his back upon personal inclinations, consented to take the Presidential Chair of the Manchester Institution of Gas Engineers. The first result is an address modest in length, but pregnant with thoughts that are of immense importance to the gas industry. There can be no gainsaying that the industry is at a critical juncture in its history; and its future position depends much upon what is done in the present. Mr. Leather in his address does not say this pointedly or in these words; but with that thought in mind, the address should be read, and the subjects and passages marked that have bearing upon it. The President is optimistic as to the future of the industry. So are we; and so is everybody with whom we come in contact who is in a position to judge from experience. This optimism is based upon possible developments; but the possibility of development is not enough. Development is not possible without preparation. Is due preparation being made? We are not desirous of replying to the question, but prefer leaving it to those who are responsible for seeing that the future does not suffer from omission in the present.

"I do not think," said Mr. Leather, that "there is an "industry the management of which demands a greater "diversity of gifts—commercial, chemical, and engineer-"ing." Over these words the responsible men of the industry may ponder. The war time period has disclosed that whatever gifts were required for the conduct of the gas business in the old days, they and more will be needed in the days to come; for in every branch of the business—the commercial, chemical, and engineering—there have been war time developments which give leave to optimistic views, but which bespeak extended qualifications and the exercise of them. Later on in the address, Mr. Leather shows that, in his view the men of the composite qualifications which are necessary now, and will be more so in future, must be capable of more than management and designing plant. He

is a strong believer in individual research, as well as collective. We are with him in this; for an industry such as that of gas, whose generally-used description only tells part of the tale of its complex operations, requires for the realization of the highest utility and efficiency not only investigation at central laboratories, but research where the daily practical work is done, and where the problems of the work are revealed, and should be studied with the view to solution and improvement. This being so, "gas undertakings "ought to be so well staffed that there is opportunity for "investigating thoroughly the conditions under which vary-"ing results are obtained in the processes of manufacture." With this, there is absolute agreement. But all gas undertakings cannot afford to be "so well staffed." This is their misfortune. Those that can, however, should be, and that with gifted men. Given such men who can and will look after the progress and development of the basic interests of the industry, there is no need to fear competitors, nor any shortening of future prosperity.

But there is the rub. Only the other day a prominent gas administrator was privately talking of the "reconstruc-"tion" work that will be necessary in the gas industry after the war. In this reconstruction more men, and men of varied and wide ability, will be wanted. Suitable men are already in office; and where is the gas industry to look to-day for those additional and qualified men for its extended and more responsible work? The question is "a poser." The industry is, truth to tell, badly off for the extra men of ability, varied attainment, and experience who will be in demand. The war has absorbed a number of the promising young men that the industry possessed. Years of training have unfortunately but unavoidably been lost to the industry; and so have years of personal experience. The sources from which to recruit for the time of reconstruction and renewed developing activity are pretty well exhausted, if not positively dry. Those administrators who want to get fresh and additional men will find a difficulty. There is a problem here that will have to be faced by the industry at the earliest possible moment; and it will be every undertaking for itself in getting hold of the best men suitable for the work that lies ahead. Those gas undertakings that cannot obtain suitable men to supplement the staff, or fill vacancies, will be left behind in the race. Let it be borne in mind that in men as in materials, quality tells.

There are several other attractive points in Mr. Leather's address. But we will only allude to one of them. That is the question of tar. It will be seen that at Burnley the President has been at work during the past year or more on tar distillation. He has not gone beyond four liquid products—crude naphtha, light oil, creosote, and anthracene oil, in addition to pitch and creosote salts. The point that we wish here to emphasize is the financial result; and the President's own words may be used: "After deducting all "expenses, and allowing for interest and depreciation, we "obtain 80 p.ct. more than the best offer received from tar "distillers immediately before deciding to erect the plant. "The cost of the plant has been paid out of revenue, and "will be entirely recouped in two years' time." This satisfactory statement will be read in conjunction with the reference in the report [published last week] of the Executive Committee of the National Gas Council, to an agreement with the tar distillers as to a basis on which to fix prices. Gas undertakings in the position to do so will consider the merits of the alternatives that are thus placed before them; and those suitably circumstanced will follow the choice of Burnley.

Action as to Coke Disposal.

Active steps are now being taken, through the Coal Controller's Department, in connection with the question of coke disposal. It is a matter that, if properly handled, will assist to the objective on which Mr. Guy Calthrop has lately been largely concentrating attention, and that is the economizing of ton-miles in the carriage of coal. It would be the greatest pity if the fullest use were not made of the production of coke to help to realize what to-day is an imperative necessity. To have fuel lying unused in a city or town while coal is being brought to it, is not a condition that should be tolerated in the cause of economy. However, serious efforts are to be instituted to make the locally produced coke part and parcel of the fuel supply of the cities and towns of the country; and this should do something to ensure that the gas industry receives an ample supply of coal for its requirements. It cannot be definitely said that anything more than preliminaries are under way, and that considerations are shaping. It is probable that one plan to be adopted will be the restriction of the quantity of household coal supplied to merchants in those places where the supplies of coke are accumulating. It may be questioned by some whether this would have the desired effect where householders are not tied, as they are in the Metropolitan area, to one coal merchant. But one has only to consider the limitation of coal prices and the condition of transport to see that fuel in a locality must be obtained from the nearest available source or not at all. Therefore the proposal as to restriction of the supplies of coal to merchants should, if consummated, automatically have the effects of dispersing coke stocks and of providing a constant demand for the coke as produced. Another safeguard that is in contemplation, is to prohibit, without permission is granted, the transport of coke from one district to another.

So far so good. But these changes cannot be made by a stroke of the pen, nor without due inquiry, nor can they be made permanent unless constant oversight is exercised with the view to ascertaining that a proper balance of conditions is maintained, in order to ensure that the disposal of one trouble is not succeeded by another. Therefore, to keep *au courant* with prevailing circumstances in all quarters, the Coal Controller has asked Mr. Thomas Glover to form a representative Committee of the gas industry. This is being done; and it is proposed that this Committee shall meet week by week until conditions are brought into better shape, the sale of coke stimulated, and full assurance provided that fuel is not unnecessarily delivered into towns. Evidence will in due course be taken by the Committee as to the conditions existing all over the country. But there is another side to these plans. It will be seen that what is at present contemplated will mean that gas-works will have some sort of monopoly in the sale of coke; and cities and towns will, to all intents and purposes, be "rationed" as to total fuel supply on the basis of the coke available. In view of this, it may probably be considered necessary to look into the matter of a suitable basis on which to fix coke prices. The Committee may also find it advantageous to discuss the means of economical distribution; and the possibilities of all coal consumers taking a reasonable share of coke. They may even go into the question of considering how best to apply local control through the local Coal Committees. From this indication of what is shaping to relieve the gas industry from the incubus of growing coke stocks in these times when it is necessary to turn every ounce of product into cash in order to meet current burdens, it will be seen that the Committee will have before them a somewhat onerous task, but one, if successful in its intended results, that will confer considerable benefit on the industry and on the consumers of gas, while at the same time it will assist the Coal Controller in the chief object he has before him in respect of transport.

However, there must also be self-help upon the part of gas-works; for there must not be complete reliance on what can be done by the Government Department. There has been an appeal to the Coal Controller; but the Coal Controller expects the gas industry to adopt every available commercial means to help itself in this matter. Coke accumulations have been due to a number of causes—among them the difficulties with distribution, not only from gas-works but from the coal merchants' depôts. But the coal merchants, as a rule, have an advantage in that their depôts are scattered about a town, or are more accessible than the gas-works, which are usually in a locality where people do not go from choice. This question of accessibility or rather of convenience is a point against gas-works, and in favour of the coal merchants. In many places, too, better methods are required to encourage the sale of coke. For instance, users of coke for steam-raising purposes complain that with a high percentage—even 20 p.ct. has been mentioned—of water in coke, they cannot be expected to get decent efficiency out of their boilers; and steam-lorry users inquire how, with such water-saturated coke, they are to mount hills. Speaking of the moisture in coke and of Mr. Glover, reminds of his Presidential Address to the Southern District Gas Association in 1914; and what he had to say then as to grading and drying coke in order to make of it an acceptable fuel, is particularly pertinent now. Many gas men have still to get away from the idea of coke as a residual, and to look upon it as a valuable secondary product which is worthy of being put upon the market in the condition best suited for promoting its sale. We know all about the present conditions

of labour; but coke is a material that women can handle. And be it remembered that what is done now will be distinctly reflected in the business of the future. The London area, it is understood, will be dealt with separately in any scheme that is finally evolved from the plans that are now under consideration.

Co-Partnership, and an Equality of Interest between Capital and Employees.

The war has wrought many changes in the gas industry. Among them, through adverse conditions, the working of the sliding-scale of price and dividend has come to grief, and gas companies are now appealing to Parliament, on behalf of their share and stock holders, to give them some redress. In certain cases, the bonus to co-partners has disappeared through the operations of the war, and no fault of their own. But meantime, bad as the result is for share or stock holders in numerous concerns, they still get something in dividend; while the men are receiving no bonus at all. This shows, in effect, that the co-partnership system had a too restricted and arbitrary basis. Some directors, regretting the loss of the bonus, and especially in these times, when the best that is in every man is more than ever required of him, have applied the principle of a minimum to the bonus, so as to ensure its continuity; and this, at any rate, is a recognition on their part of the value of the bonds of a direct financial interest in the concern apart from the payment of wages. But the minimum bonus rather assails the idea of co-partnership—co-partnership in prosperity and adversity. So does the discontinuance of a bonus, because in these times of adversity the capital-owning co-partners are receiving a dividend, while the employee co-partners are not receiving a bonus.

If a minimum bonus is not conceded to be altogether in consonance with the ideal of co-partnership, then the question is whether there is a practical alternative. The Gas Light and Coke Company say that there is; and we believe that the happy discovery may be placed to the credit of the Managing Director (Mr. D. Milne Watson). At the recent meeting of the proprietors, the Governor of the Company (Mr. John Miles) made an announcement upon the subject, which, however, appears to have been overlooked. "In the "future," he said, "the bonus will be based on the percent- "age of dividend paid on the ordinary stock of the Company "rather than on a scale determined by a limited range in "the price of gas." Giving "co-partnership" its fullest meaning, this new basis of bonus payment appears to us to be more logical than the old one, which assumed that the price of gas would not vary at any time by more than a few pence. This theory has been knocked on the head by the happenings of the past three-and-a-half years. Under the old scheme, the bonus was calculated from the price of 3s. 2d. per 1000 c.ft., at which there was to be no bonus. But no one supposed that the price of gas would ever go to such a figure again. At 3s. 1d., employees would receive ½ p.ct. on their wages; and at 2s. 6d.—the price of gas before the war—5 p.ct. Although the range of price was probably quite sufficient in former days, it was always an arbitrary basis. But now the employees, under any conditions of price, will get precisely the same bonus on wages as the stockholders get dividend on their ordinary capital. The effect will be that, at the present price of gas, the dividend will be £2 18s. 8d. p.ct., and the bonus will be the same.

It is easy to see advantages in this. The plan is one the co-partners will readily understand. Simplicity is there; the idea is actual as to sharing alike with capital in the profits earned. Whatever the conditions, be they prosperous or adverse, the employees are co-partners in the broadest sense of the word, and with specially strong emphasis on the "co." Uniformity of dividend and bonus shows more clearly than anything else could do the identity of interest between the stockholders and the employee co-partners. In our opinion, too, great benefit will be found in getting men to realize that they are being treated upon precisely the same basis as the owners of capital. It should induce a deeper sense of sympathy with the capitalist's point of view. The men will be working for the same rate of bonus as the dividend declared; and as, through the operations of market and working conditions, and the combined exertions of directors, officers, and men, the price of gas can be brought down and the dividend up, the bonus will increase with equal steps. The proposal, in short, links-up capital and labour upon a common basis; and it inserts into the co-partnership system a new feature of very practical character. Moreover, the plan, it seems to us, gives to co-partnership a foundation which should enable the system to be applied to almost any business, if not to all businesses. The labour problem is one of the greatest that lie before us. In the post-war reconstruction and in the expansion of home industries, labour will have to take a large part. An absolute identity of interest with capital will be of untold value in all that we hope for, and in all that we are labouring for.

"Financial Hardships" Bills.

The promoting gas companies have agreed to put in a combined case on the question of principle before any Committee that may be appointed by Parliament.

The Wages Question.

We understand that the proposal made by the meeting of the gas industry last Wednesday—viz., that District Councils be formed in order to meet the representatives of the Workmen's Unions—was discussed the next day at a meeting of delegates of the National Federation of General Workers and representatives of the Industry, but was not accepted by the Federation.

Rational Claims for Low-Temperature Carbonization.

Puff articles such as those appearing in the "Financier" may be considered necessary by the Coalite people to help their system along; they, of course, know their own business best. But while the articles are in full swing the owners, at any rate, of one other low-temperature system are booking-up contracts for works, and have got some on a large scale actually under construction. But these owners are not claiming that the low-temperature process of carbonization is the one thing required to bring about a revolution in the world's affairs. They realize that the low-temperature system has special uses, and a special part to play, and nothing more, and that the high-temperature carbonizing processes will be as needful as, and more needful than, they have ever been in the world. However, people are gradually being placed in possession of the information which will enable them better to judge the claims put forward in "Coalite" propaganda. The Institution of Petroleum Technologists have helped to spread information through the papers recently read at the Society of Arts, particularly those by Mr. E. H. Cunningham Craig, B.A., and Dr. F. Mollwo Perkin. The information was not new. There are cannels, bastard cannels, torbanites, and blackband ironstone which can be dealt with by low-temperature carbonization. Some of the ironstones, for instance, contain large quantities of volatile matter, which must be driven off before the iron ore can be treated; and the volatile matter can be secured in the form of oil by the low-temperature process. This is a legitimate use for low-temperature carbonization.

Quality and Quantity.

In the same papers exaggeration has had a rebuff. The claims that have been made as to production of oils per ton of material are known by carbonizing technologists to be of hyperbolic character. They require a good deal of qualification. Specially selected materials may give 40 gallons of oil per ton; but such materials are rare. Dr. Perkin says his considerable experience shows the average production to be about 20 gallons. Not only quantities but qualities vary with different materials. In one of the recent Coalite articles, the writer spoke of the products required for military and dyeing purposes. We have pointed out before, what Dr. Perkin alludes to in his paper, that low-temperature carbonization is useless for the production of benzol and toluol for explosives, aniline dyes, &c. But of the oils obtained, the lower fractions yield a light spirit which can be employed for motor cars, aeroplanes, &c., and the higher fractions yield fuel oils. Another point is that the maximum production of sulphate of ammonia—of course, there is variation with the nitrogen content of coal—cannot, working at low temperatures to get the greatest possible bulk of light oils, be realized. There must be operation at a fairly high temperature for this purpose. Within, therefore, the limits of the serviceability of the low-temperature system in dealing with special materials, there must be working on broad lines, and on a sufficiently large scale, to

attain commercial success. But the length of the commercial success of any one installation must depend upon the duration of the availability of the supply of raw materials in its neighbourhood.

Cannel Coal Carbonization in Gas-Works.

The carbonization of cannel coal in gas-works is returning to life. Many gas engineers had thought that, with the passing of the enrichment of gas for open-flame illumination, they had seen the last of cannel. But the war and the need for more fuel oil will it otherwise. The question of the utilization of our cannel resources for this purpose was raised in the House the other night by Captain Barnett; and the Financial Secretary of the Ministry of Munitions (Sir Worthington Evans) showed the House that the Department are adopting the wisest possible course in utilizing cannel by taking advantage of gas-works, with all their available equipment, staffs, and resources for manufacturing, utilizing, and disposing of the products other than those required by the Government, and this despite all temptations to land the Ministry into some heavy expenditure for low-temperature carbonization. Apart from the fact that large installations on the low-temperature system have not been proved commercially, the carbonization of cannel demands an extensive equipment other than retorts. It means putting down complete gas-works with all the auxiliaries in the way of sidings, plant for handling material, and plant for dealing with all the products. Materials and labour would not be justified in the circumstances. The Government are erecting plant at some special mines, but are not "banking" on the retorts so erected. The gas-works of the country, they have prudently determined, supply the quickest and cheapest route to the desired goal; and so, according to Sir Worthington, with various modifications and some additional apparatus, retorts at "several" gas-works in the country will soon be dealing with cannel coal—some are probably doing so already. This is a more sensible plan than the one suggested last year for adoption by gas-works.

Wages Question and a Standing Conference.

In our "Correspondence" columns last week, there was questioned the competence and authority of the National Gas Council in dealing with the wages question, and the position was the subject of editorial comment. It seems that the electrical industry is not troubled with such absolute precision in these days when the best possible has to be done to deal with uncommon situations. The various organizations of the electricity supply industry have formed what they call a "Standing Conference of Electricity Supply Associations." The constituent bodies are the Incorporated Municipal Electrical Association, the Conference of Chief Officials of London Electrical Supply Companies, the Incorporated Association of Electric Power Companies, and the Provincial Electric Supply Committee of the United Kingdom. The idea of the "Conference" is that there may be one single body of the electricity supply undertakings throughout the kingdom to deal with matters "relating to conditions of employment, the rates of remuneration of staff and employees, and other matters of general concern." Intimation as to the formation of this body has been sent to the Board of Trade, the Ministry of Labour, the Committee on Production, the Director of Electric Power Supply, and the Institution of Electrical Engineers. The new body does not appear to be worrying themselves about the Companies' Consolidation Act of 1908 or section 23 of the Trade Union Act, 1871. If there is useful work to be done in these war-turmoiled times by conference as well as by individual effort, the Standing Conference of Electricity Supply Associations want to do it. The National Gas Council are equally desirous of being useful to the gas industry.

Compulsory Acquisition of Land.

This is a matter that concerns most gas undertakings; and it has been linked-up with reconstruction. There is good resolution extant that everything possible is going to be done in better way after the war than before it. The reforming influences of the war are wonderful; and the Ministry of Reconstruction knows no bounds. One of its Committees has been considering the law and practice relating to the compulsory acquisition of land for public purposes. The "Evening Standard," which finds the present procedure by Private Bill costly and cumbrous, understands that the Committee of which Mr. Leslie Scott, K.C., M.P., is Chairman, has recommended that a small Committee of members of both Houses should be empowered to decide whether any particular piece of land should be compulsorily acquired on the score of public utility, with a right of appeal to an appellate tribunal consisting of the Chairman of Ways and Means in the House of Commons and the Chairman of Committees in the House of Lords. If there is a large extension of business, many gas undertakings may want to be buyers of land before long, and so will be concerned in the proposals. Some people have an irrational objection to gas-works for neighbours, as controversies over land powers in Parliament have shown. Others do not mind them; and some build their houses near gas-works boundary walls.

Simplification of Procedure.

A companion report is by the Acquisition of Powers Sub-Committee of the Reconstruction Committee appointed to consider the steps necessary to reduce the cost and simplify the process of obtaining parliamentary powers for the execution of public works and otherwise, with particular reference to the extension of the Provisional Order system and the desirability of moving Parliament to appoint a Select Committee of both Houses of Parliament to consider the simplification of procedure in the case of Bills. As reasons for the process of obtaining powers to execute works of public utility being simplified and the expense reduced as far as possible, the Committee point out that on the conclusion of the war there will be large arrears of this kind of legislation to be undertaken; while, on the other hand, it appears that the cost of procuring such legislation has shown a tendency to grow during the last few years, and in the financial circumstances that will probably prevail for a long time after the war there will be indisposition on the part of local authorities and promoters generally to incur any avoidable expenditure on procedure. It is admitted by the Committee that the questions referred to them are by no means new; and that for more than half-a-century Parliament has been compelled, by means indicated, to diminish the volume of Private Bill legislation by reducing the number and bulk of Special Acts. As to their recommendations, the Committee suggest the introduction of legislation in order to bring up to date the several Acts conferring general powers on local authorities and powers for carrying out public utility undertakings, and their periodical revision. The length of Private Bills, it is pointed out, is largely due to their containing many blocks of clauses, which are repeatedly granted as a matter of course, and the insertion of which adds to the cost. They therefore think that such provisions should be collected from time to time and embodied in general enactments, which could be applied in any particular cases as required. In the matter of Provisional Orders, they recommend the extension of the system in order to enable powers to be given by Provisional Order similar to those which have been given by Special Act under like circumstances; the extension of powers to make Orders not requiring confirmation by Parliament; the granting of powers enabling Departments of State to make rules for regulating procedure in connection with Provisional Orders; and the appointment of a Joint Committee of the two Houses of Parliament to consider questions affecting the procedure to be prescribed in relation to Private Bill legislation generally.

A Matter for Consideration.

In our "Electricity Supply Memoranda" this week, information is given as to various schemes which seek to be identified with the reformation of the electricity supply industry in respect of both the provision of cheaper electrical energy and the rational utilization of coal supplies. The gas industry generally, and the administrators of various gas undertakings particularly, will be interested in the schemes and visions from different quarters. They will see in them proposals for great speculation; they will notice the schism that exists between electric local authorities and electric supply companies over the reorganization question; and they will observe the existence still of a desire in some electrical quarters to carbonize more coal than is necessary, and the launching of additional secondary products on the markets, which would not do the electrical industry any more good than it would the existing carbonizing industries. However, if any of these big speculative proposals are permitted by Parliament, there ought to be some assurance that money deficiencies are not placed upon

the rates, and that the undertakings are made self-supporting. On the other hand, gas undertakings as ratepayers do not wish to see available profits handed over in relief of rates. These conditions they would prefer to have applied to themselves, as well as to their competitors. But we see in one of the suggested schemes provision proposed for deficiencies being made up by the constituent authorities. May the country be defended from such liberty to stray from prudence

Coal and Coke Exports.

According to the Board of Trade returns, the exports of coal, coke, and patent fuel in January showed, compared with January last year, a further recession—the respective figures being 2,887,573 tons and 3,488,494 tons. The aggregate estimated value of the exports last month was, however, £4,130,931, as compared with £4,588,227 in January last year. In January, 1916, the value was £3,222,250, for a total export of 3,383,099 tons. It will thus be seen how considerably the total value has increased, with a large decrease in quantity. The average value was £1 8s. 7d. per ton last month, as against £1 6s. 3d. in January last year; while the average was just under £1 in January, 1916.

Brown Coal Deposits of Victoria.

A report has been issued by the Advisory Committee appointed last year to make investigations in regard to the commercial utilization of the brown coal deposits of Victoria, particularly for the purpose of generating electrical energy; and details which have been forwarded by H.M. Trade Commissioner at Melbourne are published in the "Board of Trade Journal." Immense quantities of brown coal are available; and the Committee recommend the adoption of an electrical generating and transmission scheme, and the establishment of an open-cut mine in the vicinity of the power-house. A scheme is outlined, the total capital expenditure on which is estimated at £1,855,673. The estimates in the report are based on the assumption that brown coal in its raw state, with over 40 p.ct. of moisture, will be consumed under steam-boilers. A special furnace is used for this; the air supply being pre-heated and admitted both under the grate and at the bridge. With the use of a thick fuel bed, a semi-producer form of combustion takes place; the volatiles and moisture being driven off early, and the former burned in the upper part of the furnace by the aid of the air admitted at the bridge. Later on, the possible use of gas-fired boilers is expected to be considered; but this will be contingent upon the development of the recovery of bye-products. In this connection, low-temperature distillation, it is thought, with a large recovery of tar-oils, may ultimately prove to be a national necessity, and at the same time, a profitable undertaking. The Committee endorse the views of the Brown Coal Sectional Committee of the Institute of Victorian Industries with respect to the importance of investigating questions of gas making, bye-product recovery, and briquetting, and of research work generally relating to the commercial utilization of brown coal.

Southern District Association.—On Thursday, the fifty-third annual meeting of the Southern District Association of Gas Engineers and Managers will be held at the Society of Arts rooms, Adelphi, when the chief items of business to be dealt with are the address of the incoming President, Mr. W. B. Farquhar, of Ilford, and a discussion, to be opened by Mr. H. O. Carr, of Wandsworth, on the question of "Coal Supplies in War Time." It has been decided by the Committee that, owing to the war, it is undesirable to hold the annual dinner this year.

Appeal for Economy in the Use of Gas and Electricity.—The Controller of Coal Mines (Mr. Guy Calthrop) is repeating his appeal to all classes of consumers of gas and electricity to exercise the greatest possible economy, by seeing that "every gas-burner and electric switch over which they have control is used as sparingly as circumstances will allow." He says: "As regards lighting, we must limit ourselves to a bare sufficiency; and, while employing enough to carry on our ordinary avocations, avoid any approach to brilliant illumination, whether in our dwelling-houses, shops, or public buildings.

Increased Efficiency in Gas-Heated Smoke-Houses.—In the columns of the American "Gas Record," Mr. H. E. Gilbert quotes the results of tests made by one of the largest meat-packing firms in the country, in an old-style hand-controlled gas-fired smoke-house, and in one fitted with an automatically controlled up-to-date single-pipe system of combustion. In the second instance, a similar amount of work was accomplished in 20 p.ct. less time, with 25 p.ct. less gas, 50 p.ct. less labour, a 3 p.ct. saving in shrinkage, and greater uniformity in results. A test of the modern apparatus in comparison with an antiquated wood-fired smoke-house, operated under old-time methods, showed that, without any advance on cost of fuel, the work could be accomplished in 50 p.ct. less time with 50 p.ct. less shrinkage, and that the labour was cut down to two operators for loading and removing contents. These tests indicate the need for a standard form of smoke-house, with automatic temperature control.

PERSONAL.

After sixteen years' service as Gas Manager at Thorne, Mr. G. W. WILSON is leaving Thorne to take up a similar position at Killamarsh, Sheffield.

The Limerick Gas Committee have appointed Mr. J. ENRIGHT to the managership of their works. He was previously Manager of the Tralee Gas-Works. In reference to the appointment of a Gas Engineer in room of Mr. Hawkins, resigned, it was decided in the first instance that a Sub-Committee, consisting of the Mayor (Mr. A. O'Mara), Alderman T. M'Donagh, and Mr. T. Ryan, J.P., should visit and report on the working of the respective gas-works of selected candidates holding positions in various places.

At a meeting of the Directors of the Sheffield Gas Company last week, Mr. WILSON MAPPIN resigned his position as Chairman. The Board accepted the resignation with great regret, and elected to the chair Colonel H. K. STEPHENSON, D.S.O. Mr. Wilson Mappin has had a seat on the directorate for more than 32 years. In 1891 he became Deputy-Chairman, and in 1908, on the resignation of his father, the late Sir Frederick Mappin, Bart. (who had been Chairman of the Company for over 35 years), Mr. Wilson Mappin was elected to succeed him.

At a meeting of the Birmingham Gas Committee last week, Alderman Sir Hallewell Rogers reported the appointment of Mr. A. W. SMITH, the present Assistant Secretary, as Secretary of the department. Mr. Smith has been in the service of the Committee for twenty-three years; and for the past seven he has been responsible for the secretarial work—thus enabling Captain Hilton, who held the position of General Manager and Secretary, to devote his time primarily to the duties of the former position. Mr. Smith has also acted as Secretary to the Coal Purchasing Committee which was appointed by the City Council to purchase fuel for the whole of the Corporation Departments. The appointment of a successor to Captain Hilton, who has accepted a position with the Metropolitan Carriage and Wagon Company, of Saltley, will be made at a future meeting.

OBITUARY.

SIR JOSEPH A. BELLAMY.

Sir Joseph A. Bellamy, whose death occurred last Friday, in his 73rd year, had occupied for many years with conspicuous ability the position of Chairman of the Plymouth and Stonehouse Gas Company. He was elected a Director and appointed Chairman at a period in the Company's history when a policy of extension was needed. Under his business-like and progressive rule, this was entered upon with marked success; the works being largely developed and remodelled and the sales of gas greatly extended. It was his ambition to see the price of gas in Plymouth reduced from 1s. 9d. per 1000 c.ft., at which it stood for many years, to 1s. 6d. Progress had been made in this direction when the war broke out, and put a stop to the possibilities of its realization. In matters of administration, he held advanced views, and was always ready to listen with an open mind to suggestions of experiment and research. Some of the ideas which were given a trial at Plymouth under his administration did not turn out a success—the Coalite experiment was one conspicuous example. Generally speaking, however, the Company owe much to his wise, sympathetic, and firm direction.

In business, Sir Joseph Bellamy was a Shipping Agent, and filled the offices of Consul for France, Russia, the Netherlands, and Spain. He was twice Mayor of Plymouth, for many years a prominent member of the Town Council, and a leader in many movements for the development of the commercial interests of the port. His civic services were recognized in 1904 by the bestowal upon him of the honour of knighthood by King Edward, who, with Queen Alexandra, had paid a visit to the town during his mayoralty.

CENTENARY OF THE BATH GAS COMPANY.

CONGRATULATIONS to the Bath Gas Light and Coke Company. This is the centenary year of the concern; the first general meeting of the proprietors having been held on May 18, 1818. Therefore, Bath can be numbered among the pioneers of systematic gas manufacture and distribution; for it was but a few years ago that the Gas Light and Coke Company—the first gas concern to obtain statutory powers—were celebrating their centenary. The interesting event for the Bath Company would have been celebrated in befitting manner had it not been for the incongruity of celebration and festivity when the country is sternly concentrating its effort on winning, with its Allies, a war which demands every particle of strength that can be commanded. The Bath Company, faced with the difficulties that are universal among gas undertakings, are doing their share with the rest in meeting requirements for war purposes; and the fact that they are able to do this is in some measure a consolation for the deprivation of the opportunity of celebrating the centenary of the concern, in which the historic

city would itself have no doubt heartily joined, for the Company have been, and are, loyal servants to it.

However, the centenary took the foremost place in the speech of the Deputy-Chairman (Sir Percy K. Stothert, K.B.E.) at the meeting of the proprietors of the Company last Wednesday. Sir Percy was presiding in the absence of the Chairman (Mr. Albert Browning), who has been indisposed the last two or three weeks, and therefore had to forego the pleasure which he had been anticipating of presiding on this exceptionally interesting occasion. However, what his deputy had to say at the meeting showed the proprietors that the progress of their undertaking is something which provides good and very substantial cause for pride. In the furtherance of this progress, the late Engineer and Manager and now Consulting Engineer (Mr. C. Stafford Ellery) took for many years a large part; in the current arduous times his successor, Mr. J. Wesley Whimster, is working—assisted, as he is, loyally by those around him—with might and main to continue the reputation which the Company enjoy, subject, of course, to the repressing influences of the times. But to the centenary. If there is no formal celebration, there is a memento in the shape of a booklet tracing the history of the concern from its infantile to its centenarian days, in which it is in a stronger position than ever. The history has been compiled and written by Mr. Ellery. It must have meant considerable and painstaking research; and we wish that the restrictions under which we are placed in regard to paper supplies did not prevent a pretty free dip into the narrative of the life of the concern and the illustrative statistics.

But, briefly, in the years preceding foundation, during which the scheme of providing a gas supply by enterprising men was under discussion, there was in the city the usual division of opinion—those in favour and those in vehement opposition, the latter on the ground of untold evil. Those were days naturally of small knowledge in relation to gas supply; and we smile at the uncomfortable forebodings of those times with surrounding to-day a universal gas supply in aggregate volume undreamed of then as a possibility, and with gas classed as an indispensable commodity in homes and industries. The discussion for founding a gas supply for Bath commenced in 1815—three years after the Chartered (now the Gas Light) Company obtained their Charter of Incorporation. The discussion ran high through 1816 and 1817; but on May 8, 1818, the Bill that was promoted received the Royal Assent. The capital was fixed at £50,000, of which "£10,000 was to be reserved as a fund for paying any damages awarded against the Company." It was then also agreed that the gasholders and works should be erected outside the city. From the particulars given by Mr. Ellery, it is seen that the tender of a Mr. Daniel Horton was accepted for two gasholders, each 45 ft. in diameter by 20 ft. deep, which were enclosed in buildings. The retorts first used were of cast iron, 2ft. long by 13½ in. diameter, and costing £12 per ton. Says Mr. Ellery:

> Notwithstanding early difficulties, the undertaking met with immediate success "exceeding the most sanguine expectations" of the Committee. At the end of 1819, the number of lights, exclusive of public lamps, was "more than 875; and the income exceeded £3800—enabling the Committee to recommend a dividend of 2½ p.ct. for the half year—a circumstance which they believe to be almost without precedent in the annals of other companies so soon after lighting up."

Thus from the start the Company fully justified the hopes and enterprise of its founders; and it is interesting to note that, notwithstanding opposition, competition, and difficulties numerous and varied, it has steadily continued to supply the city with gas for 100 years at a price gradually falling from 15s. per 1000 c.ft. to the pre-war figure of 1s. 10d., while paying to the shareholders without any break half-yearly dividends as set forth in the appended schedule.

The confidence of the public in the undertaking at the earliest date is evidenced by the result of a sale of shares recorded in 1819, producing a premium of £3 7s. on each share, £14 paid. In August of the same year, a sale of 3 p.ct. Consols realized £71⅜ p.ct.

To-day the works stand on a site with an area of 12 acres on the River Avon. The retort-house is 380 ft. long, and contains thirty-one settings of eight 20 ft. through retorts, heated on the regenerative system, and capable of producing 3 million c.ft. of gas per day. The two gasholders at the works have a capacity of 2,450,000 c.ft., and a third at Widcombe has a capacity of 360,000 c.ft. The newest additions to the apparatus on the works are the benzol-recovery plant and the dehydrated tar plant. In 1916, the capital was £359,948; the gas made 756,732,000 c.ft.; and the gas-rental £71,752. It is good progress, and good history. The record is one of studied service to the citizens; and the low price charged for gas before the war (as mentioned in the quoted passages) tells its own tale of capable management. May the prosperity of the past be continued at the old high level when the clouds of war are dispelled, and we are once more living in the sunshine of peace.

STRUCTURE AND STANDARD GRADING OF BYE-PRODUCT COKE.

A PAPER read before the American Society of Mechanical Engineers by Messrs. C. J. Ramsberg and F. W. Sperr, jun., of the H. Koppers Company, of Pittsburg, Pa., contains some interesting information not only for managers of coking plant, but for all concerned in the carbonization of coal.

Within the last three years the coke-oven capacity in the United States and Canada has practically been doubled. On Jan. 1, 1915, it included 6438 ovens, capable of carbonizing 24,000,000 tons of coal, and producing 18,000,000 tons of coke per annum. Although 5000 ovens of the beehive type had since been discarded, the corresponding figures on Jan. 1 last were 9900, 47,400,000, and 35,000,000.

The saving of fuel by substituting bye-product for beehive ovens was estimated at 825 lbs. per ton of coal, comprising:

9000 c.ft. of 550 B.Th.U. gas used as fuel, equal to	350	lbs. coal
12 gallons of tar	133	,,
120 lbs. of coke breeze used as fuel	100	,,
Light oils, 4½ gallons	42	,,
Saving in the blast-furnace	200	,,
	825	lbs. coal

The first leading event that had pioneered the bye-product system was the appointment of a Committee of investigation by the United States Steel Corporation in 1906, and the next was the introduction of silica material, which led to more even distribution of heat, higher coking temperatures, and shorter coking periods, enabling coal of higher volatile content to be used either singly or in admixture with a lower volatile quality, increasing the yield of liquid products without prejudice to the quality of the coke. Another event was full appreciation of the great practical importance of limiting the width of oven. Increased length and height gave a larger cubical content, which reduced first cost and operating labour. But practically all the heat supplied to the oven came from the side walls, and flowed towards the centre; the velocity of such flow being governed both by initial temperature and resistance. It was shown that in a 16-in. wide oven the average heat velocity would be greater, enabling a more than proportionally shorter charge, more coke to be made in a given time with the same initial temperature, or the same make secured with a lower temperature. The wider the oven the greater the proportion of over-coking, which was prejudicial to value; and the lower the initial temperature, the greater the yield of liquids, the longer the working life of the oven brickwork, the less the "sponge" in the coke, and better quality from the same coal, or equal quality from higher volatile coals giving a larger yield of liquids. The most recent advance was the universal recovery of light oils, for which few plants were equipped before the war.

Immediately the charge is introduced, the layer touching the side walls is rapidly raised in temperature, and at about 400° C. becomes pasty and in a state of violent ebullition, due to the rapid expulsion of volatile matter, quickly followed by solidification; the vesicular form and structure developed in the first stage being maintained. Meanwhile, the adjacent layer towards the centre has reached the pasty condition; being assisted by the penetration of some of the hot soft material from the outer layer. There is a gradual progress of two zones of pasty matter, probably not exceeding ½ in. in thickness, advancing towards the centre until they meet. The coal in the centre between the zones remains comparatively cool up to an advanced stage. Tests taken at the centre and 39 in. above the floor showed that it retained a temperature of 10° C. for 2½ hours after charging, then rose to 100° and remained steady for 10½ hours, and did not reach the pasty stage for another 7 hours. The rate of advance of the zones was influenced by the initial temperature, and averaged ½ in. per hour. But the start was much more rapid; and there was a gradual slackening as the distance from the side wall increased.

As to the coke. A characteristic shape, dependent partly on the description of coal used, but also to a great extent on the method of treatment, is always observable, and may be distinguished as "block" and "finger;" the former being preferred. Coals containing more than 30 p.ct. of volatile matter show a tendency to "finger" formation, more pronounced if the oxygen content is also high. By slower working at lower temperature, this tendency may be disguised by the cementation of the finger pieces into large blocks; and by carefully regulated heat treatment, in ovens specially designed to suit the coal, genuine block coke can be obtained from many coals usually supposed to produce only "finger."

The surface of the coke does not show the true development of the characteristic cellular structure, nor do fractures following the natural lines of cleavage. A good cross section must be carefully obtained. Samples for comparison must be taken at a standard distance from the wall, as cells are apt to increase in size from the sides towards the centre. The surface of a properly-made break has a granular appearance, with steel grey lustre and well-defined cells, on the side showing towards the wall. The other piece has a characteristic graphitic lustre, with flatter and less sharply defined cells. Cell structure is always recognized as an important feature; and the authors use a set of four typical examples for comparison, each cut at a distance of 1½ in. from the wall, by which it is easy to grade cell structure on a more definite idea than is conveyed by loose terms such as "close" or "fairly open." Coke should also be classified as to regularity or otherwise in cell structure. Too much reliance must not be placed upon apparent and absolute specific gravity, or porosity. A coke of small cells and close texture may give similar results to one having large cells and relatively thick walls. The cell walls and surface are the most important; cell space and porosity being merely incidental. A test of these properties shows that standard cokes may vary as much as 10 p.ct. in these respects.

Small quantities of "sponge" are not a serious objection; but it is well to get rid of it entirely. The remedy is a mixture of low volatile coal, sufficient to absorb the excess of bituminous material that is the cause of the formation. There is much difference in the proportions required. By proper design and proportions of oven, control of temperature, time, and other detail, a wide variety of coals that produce sponge under usual conditions can be freed from it without admixture. By a similar course, a cell structure too dense can be ameliorated. Before setting out new plant, the properties of the coals to be used should be carefully studied.

The annual meeting of the British Association for the Advancement of Science, which was to have taken place this year in Cardiff, has been cancelled for the second year in succession.

ELECTRICITY SUPPLY MEMORANDA.

THE way out of the beautiful imbroglio which exists in the electricity supply industry regarding its future reformation, would not be very clear if left to the determination of the contending forces within the pale of the industry itself.

Fuel Supplies.

Recent electrical literature has shown how intensified the complication has become. It is due practically to two causes—the composition of the Board of Trade Committee on Electric Power Supply, and the report by the Sub-Committee of the Reconstruction Committee who have been dealing with the question of the industry's reorganization. This report has been the most aggressive document that has ever been hurled at the heads of the electricity industry; and it has done more to ruffle the tempers of local authorities owning electricity undertakings than anything within knowledge. It was a most undiplomatic report; and the fact that Mr. C. H. Merz was a member of the Committee, and is also of the Board of Trade Committee, with his well-known predilections in favour of large company enterprise, has not done much to improve the feelings of municipal bodies. However, the Board of Trade Committee have done the gas industry the honour of inviting before it representatives from the National Gas Council to give evidence; and these representatives asked the Committee to consider whether there is any need for the electrical industry to saddle itself with coal carbonization and bye-product recovery when there is an immense amount of capital already invested in similar plant belonging to gas undertakings. Through this plant, and as needed by its extension, the electricity industry can get all the fuel—solid or gaseous—that it requires. Reconstruction does not want waste. To have a redundancy of coal-carbonizing plant in the country would be waste; to have a redundancy of coal carbonized would likewise be waste. The national economic position is not to be improved by such means. It is also highly questionable whether enormous generating plants are required, with their unknown costs for transmission, in view of the fact that gas undertakings can supply fuel—gaseous fuel produced from coke if necessary—or the existing gas-works be developed by having electricity generating plant erected upon them, and the fuel as produced be transferred direct to the plant. There would be greater safety and control in such a scheme than in the supply of electrical energy from a distant generating station. The South Suburban Gas Company are by their Bill asking Parliament for powers to supply electricity undertakings with fuel, heat units, or electrical energy; and an informative reference to the matters by the Chairman (Mr. Charles Hunt) will be found in his address to the proprietors, as reported last week. Excepting here and there, however, the electricity supply industry does not pay much heed to what the gas industry can do for it, though a number of generating stations, and an increasing number, are now using with advantage, where correctly applied, its chief secondary product. Some electrical engineers who are not favourable to entering into the (to them) unknown region of coal carbonization and secondary products working, of which they have not the experience of years behind them as have gas engineers, think and talk of coke-oven gas and low-temperature carbonization. But coke-oven gas will in the future development of the chemical side of coke-oven working be largely required by the owners of such plant; the gas from low-temperature carbonization will be of limited order, and will not go far in the realization of a new fuel supply for electricity generation. The electricity industry had better build its future on something of existing solidity rather than upon pseudo notions as to possibilities.

Local Authorities' Scheme.

But let that pass. The Sub-Committee of the Reconstruction Committee would wipe-out local authority management of electricity supply undertakings. The local authorities see the hand-writing on the wall; but their resistance is going to be strong. The Incorporated Municipal Electrical Association and the Association of Municipal Corporations, through the Hon. Secretary of the former (Mr. H. Faraday Proctor), have sent a statement to the Board of Trade as to their views of what should be done in the reorganization of the industry and to clothe it in a garb of greater efficiency. And they, in their turn, propose that—save in London and on the North East Coast, through their exceptional conditions—private enterprise in electricity supply should be wiped-out. Between the two sets of counsellors, the Board of Trade and Parliament will have a nasty job over which to arbitrate. Whom are they to believe? Which course are they to take? That proposed by their own appointed Committee, or the one advocated by a vastly greater number of electrical men, who, although in the employ of municipal authorities, may have right upon their side? And, as a matter of fact, up to a point we think they have, as they prefer the safe and common-sense course of reaching the goal by gradual stages, in preference to that of jumping to the goal at one spring, and destroying or crippling the service of the undertakings which exist, so running the industry into an enormous expenditure of capital, and laying waste that which has already been made. The local authorities through their several Associations recognize that something must be done; and so they, in their statement to the Board, make certain proposals, supplemented by using the development of supply areas in the gas industry as an exemplar of what they themselves should do. They suggest that supply areas should be delimited by suitability for electric service rather than by local government boundaries, having regard to demand and favourable sites for generating stations. It is agreed that different conditions will apply to generation and distribution; so that these need not necessarily all be in the same hands. But the best use possible should be made of present systems of generation, transmission, and distribution. In many cases, Joint Boards could be established for the generation of all the energy required; the Boards being constituted of representatives of the local authorities. To these, the existing generating plant and transmission mains could be transferred. Alternatively, pattern might be taken by what has been done in the case of large gas undertakings which have absorbed surrounding small undertakings, to the benefit of all concerned. In the opinion of the local authorities, it would be a fatal mistake to depart from the principle that (so they say) Parliament has acted upon, with few exceptions, for many years past—that undertakings of all descriptions which involve a monopoly, and upon which the prosperity of the people depends, should be entirely in the hands of the public authorities. This certainly is not true in regard to gas supply, in connection with which Parliament has been strongly opposed to compulsory purchase. Where companies are supplying electricity, it is suggested that the best course would be for the Joint Board or the extended municipal undertakings to acquire them upon fair and reasonable terms; special consideration being given to the London Companies, and to the group of companies operating on the North-East Coast.

Scheme for Greater London.

Passing from the scheme suggested by the Associations, from another quarter comes an ambitious project for Greater London, in which project the gas undertakings in the same area will be immensely interested in view of the powers proposed. It is the outcome of a conference of local authorities owning electricity undertakings in Greater London; and the scheme agreed upon has been put into a draft report by a Committee of the London County Council. The area it is suggested shall be covered by the scheme comprises London and Middlesex, and parts of Essex, Hertfordshire, Kent, and Surrey, and includes the areas of such local authorities as are within or cut by a circle having a radius of twenty miles with its centre at the East Ham Town Hall, or such larger area as may be decided by the Board of Trade to suit a national scheme. The central authority, it is proposed, should be known as the Greater London Electricity Board, to whom should be transferred the existing powers of compulsory purchase now vested in the London County Council and other local authorities within the area. It is contemplated that the Board should undertake the supply of electrical energy to authorized undertakers within and contiguous to the area of supply. The Board, it is suggested, shall have wide powers conferred upon them. Among those in which gas companies will be particularly concerned will be these:

> To use stations where found desirable as centres for the supply of hot water and steam for domestic and industrial purposes; to sanction and advance loans to local authorities for the establishment of heat undertakings and refuse destructors to be worked in connection with the supply of heat; to trade in all bye-products resulting from the operation of their works; to enter into agreements, and, failing agreements, to have compulsory powers enabling them to purchase from all bodies or persons within their area waste heat, steam, gas, or any kind of energy; to own and operate all pipe-lines, shipping, and other transport facilities for the conveyance of plant and raw materials to the works, and distribution of bye-products; and to supply steam and hot water.

The scheme proposes protection for consumers in regard to price; and there is also a proposal to eradicate uneconomical stations by permitting the Board to prohibit any undertaking that uses more than x lbs. of coal, or a larger proportion if of less calorific value than x B.Th.U. In such an event, compensation is to be provided for. The report also deals with financial arrangements, but, at present, in very general terms.

The Aggressive Yorkshire Company.

Returning to the tussle between companies and the local authorities for supremacy in the anticipated reorganization of the electric supply industry, there has been renewed attention given to the plans of the Yorkshire Electric Power Company as outlined in the Bill deposited in Parliament. Their attitude is regarded as highly aggressive by the local authorities in their area. The Company are working now with the view to compel local authorities to patronize them, or, if unsuccessful, then they will be worse off than before, as they will have to pursue the old wearisome journey, with the local authorities more strongly hostile to them than ever. We see no reason why the powers sought by the Company should be conferred upon them more than upon any other extensive undertaking in the area. The rich anticipations of the promoters of the Company in 1900-1 have not up to the present been realized. They are doing a little better now with the war time demand for electricity—paying this year 5 p.ct. on the ordinary capital; but it was not until 1914 that the ordinary shareholders secured 1 p ct., and last year they had 3 p.ct. However, all the seductive argument that can be found by the Company is being utilized in order to gain the local authorities over to their side. The Engineer (Mr. W. B. Woodhouse) has been lecturing at Dewsbury; and

from what he says it may be taken that the Company are trying to win-through by posing as great coal economists. They are, we believe, using at one station coke-oven gas; and it is also understood they are in alliance with the Barnsley Smokeless Fuel Company (the much advertised Coalite off-shoot) for the use of gas to be supplied by them. There is also glib talking as to bye-products. Mr. Woodhouse voices the doctrine that we must increase the productivity of our coal in order to realize more for export, and so bring money here from abroad. Rather than export the coal, we should prefer to increase the output of home manufactures from our own coal, export these manufactures, and so increase the importation of cash. But people regard all these things in different lights; and the local authorities are not looking at the Yorkshire Company's scheme in the same light as the promoters are doing. So it comes about that every week, the ranks of opponents to the Company's scheme extend, which makes the short thin line of authorities taking from them electricity in bulk look smaller than ever.

Government Departments and War Time Electricity Charges.

In connection with electricity supply, and the recent 12½ p.ct. bonus award, the Ministry of Munitions have recognized the principle that consumers should share (even long-term contract ones) in bearing the increased burdens of the war; and the same department learns that the Board of Trade, in respect of consumers both for power and light supplied under contracts alterable by short notice, are prepared, if necessary, to consider on their merits applications for the revision of maximum prices, if the Act or Order of the undertaking provides for it. There are other consumers—viz., those with long-term contracts at pre-war rates—whose works are now controlled establishments. In reference to these, the Ministry of Munitions are of opinion that a reasonable advance in price should be paid for the energy supplied, but that other consumers should be similarly dealt with—that is to say, the burden should be spread over all classes, although not necessarily by an addition of the same percentage advance in each case. In the case of this class of long-term contract consumers, the Ministry make reservations—viz., "That the revenue resulting from an advance in prices shall, if more than sufficient to show the same return on capital as was earned during the financial year prior to the outbreak of war, after setting aside the same rate for depreciation or reserve, be dealt with in such manner as the Minister may decide. That any advance in price under long-term contracts shall continue only during the period of Government control, unless the consumer otherwise agrees." There are also consumers with long-term contracts at pre-war rates whose works are uncontrolled. As to these, the Minister is of opinion that they should voluntarily comply with the demand of the undertakings for a temporary advance in price on similar terms to those proposed in the case of the controlled establishments; and in this opinion the Board of Trade concur. If any difficulty be experienced in securing by consent an increase in price from uncontrolled establishments still paying pre-war rates for energy, procedure is open to suppliers under the Courts Emergency Powers Act; but the Minister hopes that in very few cases would it be necessary to have recourse to this procedure. This information applying to electricity is interesting to gas undertakings in these days when earnings are altogether out of proportion to business done through a combination of causes infinitely worse than anything experienced by electricity undertakings.

EFFECT THE REMOVAL OF LIGHT OILS FROM GAS HAS UPON ITS QUALITY.

The last issue received of the "American Gas Institute News" contains the text of a long paper that was prepared for the twelfth annual meeting [1917] by Mr. L. J. Willien, the Chief Chemist of the firm of Messrs. C. H. Tenney & Co. He wrote: We all know that the production of benzol and toluol has increased tremendously since the outbreak of the European war in August, 1914. We also know that this increase comes largely from the gas made in bye-product coke-ovens.

Previous to 1915 very little was known about scrubbing the light oils from gas, and the effect the removal of these oils had upon the quality. It was quite natural, therefore, that companies manufacturing gas for city use hesitated about installing a light-oil stripping plant without knowing, with a fair degree of certainty, what the results would be—especially if the gas had to meet a candle power or heating value requirement.

Several articles have appeared in the various journals within the past year on the recovery of benzol and toluol from gas. They have dealt principally with coke-oven gas. There have been very little data published on the recovery of light oils from carburetted water gas, or mixed coal and carburetted water gas.

There are three methods of removing the light oils from gas.

1. Absorption of the light oils by scrubbing with a high boiling oil, with the subsequent separation of the light oils by distillation.
2. Compression.
3. Cooling.

The first method is the most efficient and practical way of recovering the light oils as well as the one universally used. The oils that drop out of the gas when compressed for high-pressure distribution usually contain considerable quantities of benzol and toluol. The amount of oil that drops out of a gas on compression depends on the pressure, the temperature, and the character of the gas. For a given pressure, more oil will be obtained from a carburetted water gas than from coal gas. Previous to August, 1914, the disposal of the oils that dropped out in high-pressure distribution systems was quite a problem for most companies. There was no market for the oil; and because of its odour it was a nuisance wherever it was placed. For the past two years it has been possible to sell this oil to explosive manufacturers at a very good price.

In coal gas manufacture the average yield of light oils is about 3 gallons per ton of coal carbonized. The light oils recovered will have approximately the following composition:

Benzol	50 to 60 p.ct.
Toluol	12 to 13 ,,
Solvent naphtha	10 to 12 ,,
Heavy naphtha and wash-oil	13 ,,

The amount of light oils it is possible to recover from carburetted water gas depends upon the quantity of gas oil that is used in its manufacture. With thorough scrubbing, the light oil recovered will be about 10 p.ct. of the gas oil used, and will have approximately the following composition:

Benzol	35 p.ct.
Toluol	25 ,,
Solvent naphtha	10 ,,
Heavy naphtha and wash-oil	30 ,,

The temperature at which the gas oil is cracked will have some effect on the composition of the light oils produced in water gas. Between 1300° and 1400° Fahr. seems to produce the maximum amount of toluol. A higher temperature will tend to increase the benzol, while a lower temperature produces paraffins and olefines which are objectionable to explosive manufacturers on account of them forming a sludge in the nitrating process which it is difficult to remove.

With an average mixed coal and water gas the total light oils produced will run between 0·25 and 0·30 gallon per 1000 c.ft. The composition of these light oils will vary with the proportions of coal and water gas that make up the mixed gas. It will be somewhere between the figures given above for the composition of the light oils from coal gas and water gas.

Tables I. to V. inclusive, in the appendix, will give some idea of the effect which the removal of light oils from different kinds of gas has upon its quality. The tables show that in each case there is a very decided reduction in the candle power, and unless the benzol is returned to the gas it would not be advisable for a gas company operating under a candle-power standard to undertake the recovery of light oils from their gas.

The reduction in B.Th.U. is relatively small, and it is doubtful whether the loss in heating value resulting from the removal of light oils harms the gas from the consumer's point of view. A gas company, therefore, operating on a satisfactory B.Th.U standard, should be able to recover the light oils without getting into any serious trouble. The drop in candle power may cause some complaints from users of open-flame burners. The number of such burners in use at the present time is so small that any complaints from that source should be easily handled. In some places, where there has been a reduction in candle power in changing from a candle-power standard to a heating value standard, it has been found that the Bray union-jet open-flame burner gives about 50 p.ct. more light than the Bray slit burner.

While the reduction in candle power and B.Th.U. caused by the removal of light oils from gas may be considered as a disadvantage, there are some things removed from the gas along with the light oils that improve the quality of the gas—offsetting the disadvantages of the loss in candle power or heating value. These advantages are:

(1) A more permanent gas will result. There will be very little, if any, loss in quality in the distribution system; and it will stand up better under high-pressure distribution and can be subjected to higher pressure or pumped greater distances.

(2) When scrubbed thoroughly with a petroleum oil or other oil that has no naphthalene in it, the naphthalene in the gas is greatly reduced, and thereby stoppage complaints are reduced to a minimum. Since 90 p.ct. of "poor gas" complaints are due to poor pressure caused by stoppages in the service, anything that would tend to reduce such stoppages would contribute greatly toward better service to the consumer. A consumer rarely complains so long as he gets all the gas he needs. It is when he does not get it, that he complains.

(3) The carbon bisulphide content of the gas is reduced from 30 to 50 p.ct., depending on the thoroughness with which the gas is scrubbed. Scrubbing the gas is as efficient a method of removing the carbon bisulphide, and probably more certain, than lime purification. The heat treatment process of purifying gas is the only practical process for reducing the carbon bisulphide which is more efficient than scrubbing. This removal of carbon bisulphide is an important improvement of the gas from a hygienic standpoint. Although very little is heard nowadays about the sulphur content of the gas, nevertheless its removal is of some consequence—especially in places where there is a legal limit to the amount of sulphur allowed in the gas. If a gas company operating under such a restriction undertakes to remove the light oils, it would be

possible for them to use a cheaper coal, which they could not do otherwise, on account of the sulphur content.

(4) The accumulation of drip-oil in the distribution system is very materially reduced. This is quite an advantage from the distribution standpoint. The absorption of light oils by a wash-oil is a mechanical action. The quantity of a given light oil that the wash-oil will absorb is a function of the temperature of the wash-oil and the vapour pressure of the light oil. As the temperature of the wash-oil increases, the amount of light oils absorbed decreases; and the higher the vapour pressure of a light oil, the less the amount absorbed by a given amount of wash-oil.

Theoretically, if a gas is scrubbed with a wash-oil that is saturated with benzol, it should be possible to remove the toluol without removing the benzol. In order to recover the toluol, it would be necessary to separate the light oils from the wash-oil by fractional distillation; and the benzol recovered should be returned to the wash-oil before being circulated through the scrubbers.

Some plants operating under a candle power standard undertook the removal of toluol from their gas according to the above theory, by scrubbing the gas with a wash-oil containing from 3 to 4 p.ct. of benzol. While such a method had very little effect on the candle power or B.Th.U. of the gas, it was not as efficient for recovering the toluol as removing all the light oils from the gas. In case it is desired to recover only the toluol, it is best to remove all the light oils, separate the benzol by fractional distillation, and return it to the gas with a regular benzol carburettor. In this way, an enrichment of from 25,000 to 30,000 candle-feet can be obtained per gallon of benzol used. Such an enrichment will be permanent, and will not drop out in the distribution system. This holds good for a gas of 20 candles or less. With a higher candle power gas, there will be a drop in the distribution system, although not so much as there is if the gas is not scrubbed. Better enriching results are obtained by using the benzol alone, without mixing the solvent naphtha with it.

It was stated at the beginning that removing the light oils is something quite new to the gas industry. From the experience and knowledge that have been gained within the past two years, there is promise of such a process being the means of enabling a gas company to send out an unusually uniform gas, especially in heating value. Knowing the B.Th.U. of the gas after scrubbing, and taking 135,000 B.Th.U. as the heating value of a gallon of benzol, it is a simple matter to calculate the amount of benzol to return to the gas to bring it up to any given heating value. For candle power, use an enriching value of 27,500 candle-feet per gallon. It is also possible to figure what the approximate reduction in candle power and thermal value would be by removing a given amount of light oils from gas. For every tenth of a gallon of light oils removed per 1000 c.ft. there will be a reduction in the heating value of about 13 to 14 B.Th.U. per cubic foot and between 2 and 3 candles in candle power.

Removing the light oils from a gas greatly increases its capacity for picking-up any light oils and naphthalene it comes in contact with. If a gas company undertakes to remove the light oils from gas, any accumulation of oil or sludge that is on the surface of the water in the tank of the storage holder should be removed before any scrubbed gas is allowed to run into the holder. If this is not done, trouble may follow, because the scrubbed gas (on coming in contact with these oils) will pick up the oils and carry them out into the distribution system, and will then pick up the naphthalene in the sludge.

If a gas company has experienced any naphthalene trouble in the distribution system, removing the oil and sludge from the holder will not remedy the trouble immediately, because any naphthalene deposits in the mains will be picked up by the gas, and carried to outlying districts before being deposited again. Introducing a little benzol or any other light hydrocarbon vapours into the gas will tend to overcome naphthalene trouble.

Thorough scrubbing reduces the naphthalene to a point where no trouble is usually experienced, except from the above causes. Partial scrubbing removes less naphthalene and enough of the light oils; so that when the naphthalene is deposited, it is in prime condition for stopping services. It is, therefore, better to wash a small amount of gas thoroughly rather than a large amount partially.

There have appeared in the English journals numerous articles on the increased naphthalene troubles experienced by many of the companies in England that undertook the recovery of light oils from their gas. This trouble was largely due to the following causes:

1. Scrubbing the gas with tar oil containing appreciable quantities of naphthalene, which was picked up by the gas.
2. The scrubbed gas picking up naphthaleue from the storage holder and carrying it out into the distribution system.
3. Naphthalene deposits near the works would be picked up by the gas, and carried to the outlying districts.
4. Partially scrubbing the gas, which did not remove all the naphthalene but reduced the light oils to a point so that when the naphthalene was deposited it was in prime condition for blocking the services.

The best medium to use for scrubbing the gas is a high boiling petroleum oil with a boiling point of about 270° C. Tar oils are good absorbing mediums, but they very often contain an appreciable amount of naphthalene which is picked up by the gas, which causes trouble.

CONCLUSIONS.

From the available data, the following conclusions may be drawn as to the effect the removal of light oils from gas has upon its quality:

1. The candle power is very materially reduced. Removing the light oils with a fair degree of completeness reduces the candle power on an average of 50 p.ct.
2. The heating value is reduced from 1·5 to 8 p.ct.
3. The naphthalene content of the gas is reduced about 75 p.ct. when thoroughly scrubbed with an oil containing no naphthalene. Partial scrubbing is liable to increase naphthalene stoppages.
4. From 30 to 50 p.ct. of the carbon bisulphide is removed.
5. The accumulation of drip-oil in the distribution system is less with a gas that has had the light oils removed than with a gas that has not.
6. A gas from which the light oils have been removed is a more permanent gas, and will therefore withstand more severe conditions in distribution than one from which the light oils have not been taken out.
7. Any re-enrichment added to a scrubbed gas will stand-up much better than it will with an unscrubbed gas.
8. It is doubtful whether the consumer would notice the small drop in the heating value of the gas caused by removing the light oils. As a rule, a large portion of these light oils drops out in the mains before the gas reaches the consumer. By removing the light oils from the gas before it leaves the gas-works, the consumer will receive better service by having a supply of gas of a more uniform quality, and one less liable to cause stoppages in the service pipes. The advantages thus derived should offset any drop in heating value.

APPENDIX.

TABLE I.—*Effects of Removing Light Oils from Coke-Oven Gas.*

Rich Gas—	Before Scrubbing.	After Scrubbing.	Loss Per Cent.
Candle power	13·7	10·6	22·6
B.Th.U.	590	581	1·5
Naphthalene (grs. per 100 c.ft.)	24·6	8·8	64·2
Illuminants	3·6	3·3	8·4
Lean Gas—			
Candle power	5·7	1·0	82·4
B.Th.U.	508	490	3·5
Illuminants	1·8	0·3	83·3
Naphthalene (grs. per 100 c.ft.)	27·1	6·9	74·6
Light oils removed per 1000 c.ft. of rich gas			0·106 gallon
Light oils removed per 1000 c.ft. of lean gas (0·135 × 10 = 1·35 gallons)			0·163 gallon

Candle-power tests made with "Metropolitan" No. 2 burner.

TABLE II.—*Results Obtained with an Experimental Plant Scrubbing 100,000 C.Ft. of Coal Gas per Day, Using Green Oil for the Absorbing Medium.*

	Before Scrubbing.	After Scrubbing.	Loss Per Cent.
Candle power "Metropolitan" No. 2 burner	14·3	5·3	63
B.Th.U.	544	510	6·2
Naphthalene (grs. per 100 c.ft.)	7·8	1·6	80
Sulphur (grs. per 100 c.ft.)	37·4	18·5	50

TABLE III.—*Results of Scrubbing 2,000,000 C.Ft. of Coal Gas a Day, Using a Rotary Washer-Scrubber and Green Oil.*

Temp. of Oil.	Candle Power.			B.Th.U.			Naphthalene.			Sulphur.		
Degs. Fahr.	In	Out.	Loss P.Ct.	In.	Out.	Loss P.Ct.	In.	Out.	Loss P.Ct.	In.	Out.	Loss P.Ct.
75	14·2	7·2	49	570	546	4·2	16·2	6·9	57	48·4	30·4	37
76	14·0	3·8	73	564	535	5·1	11·2	7·9	29	40·8	30·2	26
77	14·1	6·0	57	570	542	4·9	19·0	10·8	43	36·6	22·4	39
82	13·9	7·3	47	560	544	2·9	11·6	4·2	64	40·6	31·9	21

TABLE IV.—*Average Results for Four Months' Period from a Plant Scrubbing Straight Carburetted Water Gas, Returning Benzol to the Gas.*

	Candle Power.	B.Th.U.
Before scrubbing	19·3	633
After scrubbing	9·5	606
Loss per cent.	50·8	4·2
Inlet to holder, enriched	15·5	623
Outlet to holder, enriched	15·8	623
Gas oil used per 1000 c.ft.	4·04 gallons	
Light oil recovered per 1000 c.ft.	0·410 gallon	
Benzol returned per 1000 c.ft.	0·187 gallon (composition ?)	
Candle feet enrichment per gallon of benzol	32,100	

TABLE V.—*Results of a Test Made on Scrubbing a Mixed Gas Containing 69 P.Ct. of Water Gas, 3·50 Gallons of Oil per 1000 C.Ft., and 31 P.Ct. of Coal Gas.*

	Before Scrubbing.	After Scrubbing.	Loss Per Cent.
Candle power (new "D" burner)	16·6	10·9	34
B.Th.U.	594	551	7·4
Light oils recovered per 1000 c.ft.	0·32 gallon (composition ?)		

Sir Charles A. Parsons, K.C.B., F.R.S., has accepted the vice-presidency of the recently inaugurated North-Eastern Section of the Junior Institution of Engineers.

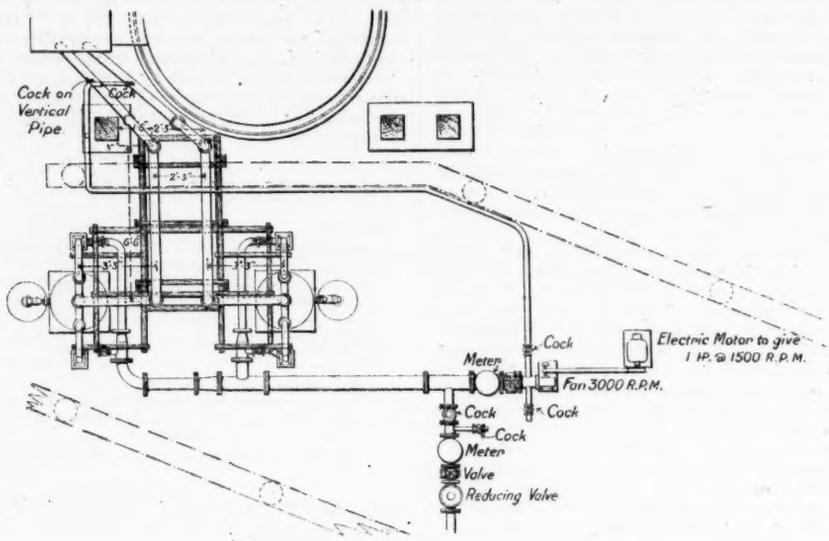
OXIDATION OF AMMONIA TO OXIDES OF NITROGEN FOR USE IN CHAMBER PLANT.

By W. GORDON ADAM, Superintendent of the Beckton Tar and Ammonia Products Works.

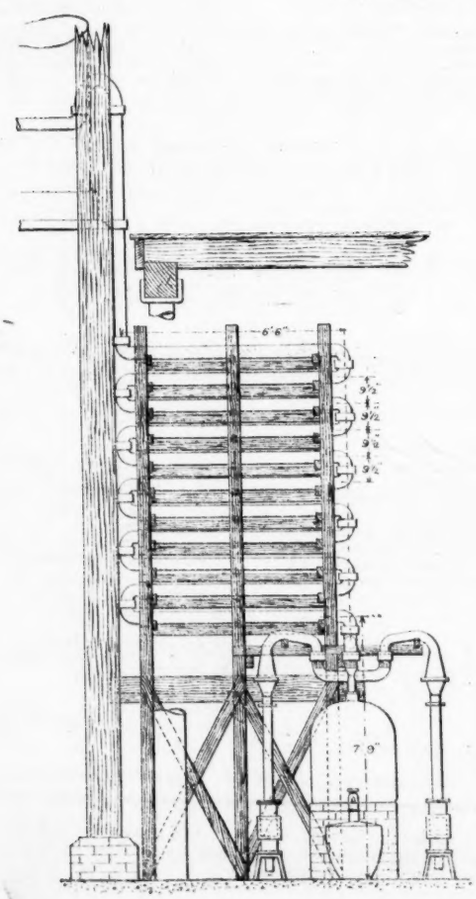
UNTIL the advent of synthetic ammonia as a commercial product, processes for the oxidation of ammonia into nitric acid or oxides of nitrogen were of scientific interest only. Ostwald's patents, taken out in 1902, showed how the oxidation of ammonia with atmospheric oxygen could be so carried out as to yield nitric acid. This reaction has been applied for a number of years to ammonia produced from cyanamide, and latterly to ammonia produced by the Haber process. The Central Powers have for some time been entirely dependent on the process for all their nitric acid; and the ammonia has been provided by the decomposition of calcium cyanamide, by the Haber process, and possibly also from sodium cyanide produced from beet residues and gas-works' residuals. All these processes produce pure ammonia free from the impurities which have to be eliminated in the production of pure ammonia from gas liquor.

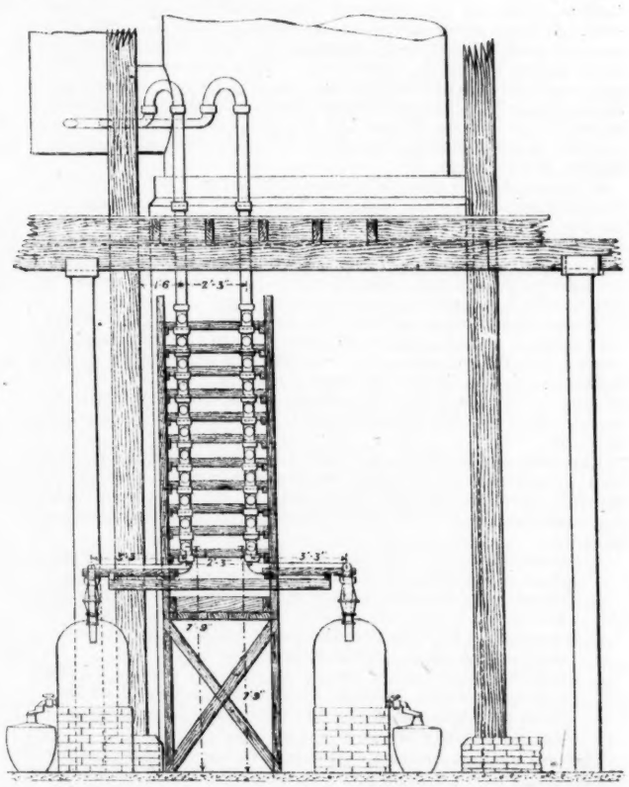
The increasing cost of nitrate of soda, combined with the fixed price of ammonia products, has at last aroused interest in the Ostwald and allied processes in this country. During the last six months, several large sets of acid chambers at Beckton have been producing their normal output of acid without the use of nitre. This result has been achieved largely owing to the very complete records of research work carried out at the Gas Light and Coke Company's Tar and Ammonia Products Works at Beckton in the years 1908-9 by Mr. C. Davis, under the direction of the late Colonel Wilton, the Superintendent of the works at that time. These experiments were carried through successfully from the laboratory to the technical stage, and provided information for the designs for a commercial unit prepared early in 1917.

In the preliminary experiments, trials were made with varying success of several types of platinum catalysts. It was not, however, until the device of several layers of platinum gauze had been



THE BECKTON AMMONIA NITRIC ACID PLANT.





tried, that anything approaching a reasonable yield was obtained. The earliest trials took the shape of passing a mixture of ten volumes of air and one volume of ammonia down a porcelain tube in which the catalyst was placed; no precautions being taken to

bring the mixture into intimate contact with the catalyst, so as to prevent unchanged ammonia passing.

Some of the first types of converter tried were: (1) Single perforated platinum foil; (2) Spiral coils of platinum wire; (3) Loose ball of platinum wire; (4) Six tiers of perforated platinum foil at ⅛-in. intervals; (5) A wad of platinum gauze about ½-in. thick.

No. 1 failed to light up satisfactorily. No. 2 failed to complete the oxidation, and allowed the ammonia to pass through unchanged. No. 3 worked well; but again, owing to not being a tight fit, ammonia passed through unchanged. No. 4 same as No. 3. No. 5 gave satisfactory results; the yields being more than 90 p.ct. of theory.

From the commencement of the experiments at Beckton, the lighting-up of the catalyst has been obtained by means of an electrically heated platinum spiral inserted in the mixture in close contact with the catalyst; a mixture richer in ammonia being passed for a few seconds until the catalyst was sufficiently hot, when the reaction produced enough heat to allow of the removal of the heating element.

The first successful apparatus consisted of a circular wad of platinum gauze, 1¾ in. diameter by ½ in. thick, fitted into a silica tube, flanged to an aluminium tube, and arranged on the counter-current principle, so that the hot oxidized gases were jacketed by the cold incoming mixture. On a larger scale, the preheating of the mixture was found to be unnecessary. The oxidation products, without cooling, were led into a series of six towers, down five of which water was passed; caustic soda being run down the sixth.

The yields of this plant ranged from 50 to 98 p.ct.; low yields always occurring when the 10 to 1 ratio was not adhered to.

The ammonia used in the experiments was the Company's ordinary make of anhydrous ammonia, testing at least 99·95 p.ct. NH_3, and was recorded by weighing the cylinders from time to time, as well as by measurement in an ordinary test-meter filled with oil instead of water. The air was not purified in any way, and was metered through an ordinary dry meter.

The velocity of the gases at the point of entering the gauze was approximately 2 feet per second. Through the gauze, however, correcting for the space occupied by the wire and also for a temperature of (say) 600° C., the velocity was as high as 9 feet per second, and the time of contact, about 0·0046 second.

The strength of acid obtained from this plant was only about 30 p.ct. HNO_3. Later on this was brought up to 50 p.ct. by circulating the weaker acid through the towers.

At this stage (April, 1909), it was considered that sufficient information had been obtained to erect a commercial unit; but the time was not then ripe for extending the process on a works' scale. It was recognized that the process would provide nitric acid or nitric oxides for sulphuric acid manufacture, should the relative values of Chili nitre and ammonia alter; and when this condition arose through the controlling of the prices of ammonia and the increasing prices for nitre, work was again started.

Early in 1917 experimental work was carried out by Mr. C. Davis and Mr. P. G. Jenkins with the object of ascertaining what degree of concentration of nitric acid it was possible to obtain by the process. The converter in this case was an aluminium box containing a window for observation, and having four close layers of platinum gauze held between asbestos rings, between aluminium flanges. The size of this converter was 1⅛ in. by ⅞ in. across the exposed portion of the gauze = 1·31 sq. in.

While these experiments were proceeding, the construction of a plant to produce 1 ton of nitric acid per twenty-four hours was gone on with, and was put to work in August.

The general run of this plant is easily followed from the illustrations. The gauze is of pure platinum four layers thick, and sewn closely together across the face, so as to avoid spaces between the layers. The window shown is 2-in. by 2-in. of clear silica obtained from the Thermal Syndicate Company.

The start is obtained by a firing-plug which is inserted only for lighting-up, and is then withdrawn, the hole being plugged up by a dummy. This is obviously a great advantage over the practice of heating-up the whole gauze by the current. The firing plug consists of an aluminium tube having a tapered shoulder to fit into a tapered tube on the lower half of the converter box. The end of this tube when in position comes nearly under the centre of the gauze, and as close to it as possible. Down the inside of the tube, two copper wires are run in glass tubes; the ends being connected to a platinum spiral consisting of 12-in. of platinum wire 0·012-in. diameter. To make this glow, 4 amperes on a 100-volt circuit are sufficient. No difficulty is found in starting when the gas mixture is enriched by turning on the small auxiliary ammonia supply fitted to each unit.

The air is provided by a Keith-Blackman blower at 6 inches water pressure, metered through a Thorp's "Rotary" gas-meter. The ammonia gas, after passing through a Bryan-Donkin reducing-valve, goes to a regulating valve and specially constructed Thorp's meter; and thence into the air pipe, and on to the converters. A ¼-in. ammonia supply pipe is also run independently to each filter box for use in lighting-up.

In order to check the yield, it was decided to isolate the nitric acid and oxides of nitrogen produced; and for this reason, the gases from the converters, after the condensation of the water and nitric acid, were passed into a tower and absorbed in B.O.V. (144 Tw.) prior to their use in the acid plant in place of nitre. The actual amounts of HNO_3 and NO_2 produced were thereby ascertained.

Numerous experiments were carried out to determine the minimum thickness of catalyst required to secure both a maximum conversion of the ammonia to oxides of nitrogen and a minimum slip of ammonia. The reactions between ammonia and oxides of nitrogen with the production of water, nitrogen, or nitrous oxide, takes place readily. It is, therefore, apparent that any slip of ammonia through the catalyst will cause a diminished yield through secondary reactions taking place immediately the oxidation products leave the catalyst.

The presence of ammonia in the liquor deposited by cooling the oxidation products may be taken as evidence that the yield of nitric oxide is poor; and it was shown that, with proper adjustment of the rate of flow of the mixture through the catalyst, combined with the correct thickness of catalyst, complete oxidation of all the ammonia passing could be secured. A minimum time-contact of the gases with the catalyst was thus proved to be necessary. With insufficient thickness of catalyst, and a slow rate of flow of the mixture, the temperature is not sufficient to keep the catalyst alive. If the rate of flow be increased until the heat produced keeps the catalyst active, unchanged ammonia slips, secondary reactions take place, and a diminished yield results.

The earlier experiments had shown that no advantage was to be gained by keeping the several layers of catalyst separate, as any partial oxidation obviously leads to secondary reactions.

It was established that the minimum thickness of catalyst was secured with four layers of gauze in close contact. Less than four layers gave slip of ammonia; while more than four layers gave no increased yield. With four layers of gauze, and the correct rate of flow of the gaseous mixture, the heat developed is sufficient to maintain the catalyst at the correct temperature to complete the oxidation without any external heat being required after the action has been started.

The yields obtained with the commercial plant have come well up to those obtained on the smaller units; but the five months' experiences have shown that some of the precautions considered essential were unnecessary, and that there are pitfalls which had not been suspected.

The gauze used in our earlier experiments was of somewhat wider mesh than that now being employed on the large scale. Information as to the supply of this from Messrs. Johnson, Matthey, & Co. was readily given to us by the Munitions Inventions Department.

MIDLAND JUNIOR GAS ASSOCIATION.

A special "Ladies' Meeting"—the first of its kind in the history of the Midland Junior Gas Association—was held in the reading room of the Council House, Birmingham, on the evening of Saturday week, the 23rd ult. A good gathering of members, with their wives and lady friends—numbering altogether more than 100—testified to the popularity of the meeting.

The President (Mr. R. G. Marsh, of Birmingham), in welcoming the ladies present, said it was the first occasion on which a President of the Association had been able to address a general meeting with the opening words "Ladies and Gentlemen." The idea was put before the Council at first with a little timidity; but, as the arrangements proceeded, it was generally felt that the meeting would be well supported, and this had proved to be the case.

The first part of the evening was devoted to a lecture, on popular lines, by Mr. E. W. Smith, M.Sc., F.I.C., &c., the Chief Chemist of the Birmingham Gas Department, on the subject: "How Gas is Made and Used." A large number of interesting lantern slides showing various sections of works plant, the modern uses of gas for lighting and general munitions work, and the many ways in which women are assisting in the industry at the present time, helped to make the lecture a complete success. Mr. Smith made several humorous points during his remarks, which were much appreciated by his audience.

At the conclusion, a hearty vote of thanks, proposed by the President, was accorded to Mr. Smith for his interesting lecture, and also to the ladies and gentlemen who had assisted with the evening's arrangements.

Light refreshments were then provided; and a programme of music was given by several members and friends.

Although the meeting established a precedent, it is one which, we learn, may be followed in future sessions, judging from the very interesting character of this first venture.

In the course of a lecture at the Royal Institution, Sir R. T. Glazebrook reminded his audience that as from April 1 the property of the National Physical Laboratory (which is now vested in the Royal Society) will be vested in the Imperial Trust for the Encouragement of Scientific and Industrial Research; and the income will be vested in, and under the control of, the Committee of the Privy Council for Scientific and Industrial Research. The scientific control of the Laboratory will continue to be exercised by the Royal Society. The Laboratory will continue to endeavour to discharge two functions—it will be a laboratory of industrial research, and a national testing institution or proving house.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

FORTY-EIGHTH ANNUAL MEETING.

THE Forty-Eighth Annual Meeting of the Institution was held last Friday, in the Midland Hotel, Manchester; the chair during the earlier part of the proceedings being taken by the retiring President, Mr. WALTER WHATMOUGH, of Heywood, who subsequently gave place to the new President, Mr. J. P. LEATHER, of Burnley. There was a very good attendance of members, who found ample material for consideration and discussion during the three hours or so over which the proceedings extended.

MINUTES OF THE LAST MEETINGS.

The HON. SECRETARY (Mr. G. S. Frith, of Runcorn) read the minutes of the last general meeting and of a special meeting held subsequently; and they were confirmed, on the motion of the PRESIDENT (Mr. W. Whatmough), seconded by Mr. H. TOWNSEND (Wakefield).

LABOUR TOPICS.

The presentation of the minutes was followed by a lengthy private discussion of the labour question; a resolution on the subject being submitted and approved by the meeting.

CONDOLENCES.

The PRESIDENT remarked that they had a considerable amount of business to get through, and time was passing. The first thing he had to mention was a letter with reference to the death of Mr. Shaw, who was the Superintendent at the Salford Gas-Works. There was also the passing away of Mrs. Potts, the wife of Mr. C. Potts, of Hyde. A letter of condolence had been sent to Mr. Potts, but not to the relatives of Mr. Shaw. They would combine the vote of sympathy in the two cases.

This vote the members passed by silently rising in their places.

A NEW MEMBER.

The next business was the introduction of a new member—Mr. Daryll J. Branson, Gas Engineer, Pontefract.

ANNUAL REPORT AND STATEMENT OF ACCOUNTS.

In the course of their report, the Committee recorded with much pleasure the fact that the membership had been more than maintained; the figure being 203, or an increase of two over the previous year. They referred with feelings of deep regret to the deaths of Mr. Charles Eastwood, of Birkdale, an honorary member, who for many years was the Engineer of the Linacre Gas-Works, Liverpool, and of Mr. J. B. Fenwick, of Retford. Mr. Eastwood was elected a member in 1879, and was President in 1883. The proceedings at the various meetings held during the year were next briefly set forth; and it was added that, in addition to the matters there presented, the Committee had also given much consideration to the following subjects: Wholesale Coal Prices Order, 1917; the ash content of coal; the financial hardships of gas undertakings; the marketing of benzol after the war, representation on Coal and Coke Supplies Committees; the withdrawal of leaving certificates; increased output of tar; and the Skilled Wages Order, 1917, No. 1061. The annual reports of the Lancashire and the Yorkshire Commercial Sections, submitted to the members, contained records of much useful information. Mr. G. S. Frith, of Runcorn, was elected the representative of the Institution on the Council of the Institution of Gas Engineers, and Mr. J. P. Leather (Burnley) on the Executive Committee of the National Gas Council. Mr. S. Tagg, of Preston, and Mr. A. E. Mottram, of Ossett, were appointed representatives on the Council of the Lancashire and Yorkshire Junior Associations respectively.

The statement of accounts accompanying the report showed, after payment of the outstanding account, a debit balance of £21 13s. 7d.

The PRESIDENT said the report was not a very long one; but those members who had read it would have seen that they had done very considerable business during the past year. In the statement of accounts, he was sorry to have to point out that there was a debit balance of £21 shown, after paying £33 outstanding for "Reports of District Associations." If they compared the various items, they would find that the cost of railway fares was a very substantial figure; and the expenses of Committee meetings had also increased. There had been eight Committee meetings, as against three in the previous year; and the railway fares were £16 more. Thus the expenditure, for the first time, had really given them a debit balance for the year. However, he supposed that if there was a debt on a concern, it was a sign of progress. There was another item to which he might call attention. Expenses of secretary and deputations £19 8s. 6d., as against £2 6s. This was a very heavy amount; but it was due to work in connection with the National Gas Council. Taking these facts into consideration, the year's operations would, he thought, be regarded as satisfactory. He might explain that, in order to overcome this deficit, the Committee were recommending that the annual members' tickets should not be published for the present, and that the volumes of "Reports of District Associations" should be sold at cost price in future—which would be 7s. 6d., instead of 2s. 6d. He moved that the report and accounts be adopted.

Mr. R. H. GINMAN (Leek) seconded the resolution.

Mr. H. KENDRICK (Stretford) remarked that, glancing down the report, he did not notice any reference to the question of gas supply to motor vehicles.

The PRESIDENT pointed out that it was stated that, at the October meeting, the members discussed and adopted the Sub-Committee's report on filling arrangements for containers of gas-driven motor vehicles.

The motion was then carried.

REPORTS OF COMMERCIAL SECTIONS.

Mr. KENDRICK said that, in the absence of Mr. Meunier, he would move the adoption of the report of the Lancashire Commercial Section, as already circulated among the members.

Mr. SAMUEL GLOVER (St. Helens) seconded.

Mr. J. H. BREARLEY (Longwood) said he had been asked to move the adoption of the Yorksbire report, which he did with pleasure.

Mr. ROBERT WATSON (Doncaster) seconded; and the reports were adopted.

INSTITUTION OF GAS ENGINEERS BENEVOLENT FUND.

On the proposition of the PRESIDENT, it was decided to grant the sum of £10 10s. to the Benevolent Fund of the Institution of Gas Engineers.

DISTRICT ASSOCIATION REPORTS.

The PRESIDENT submitted—"That for the future the publisher's price be charged for the 'Reports of District Associations.'"

Mr. SAMUEL GLOVER: How will it be known by members how much to send to cover their subscription and the book?

The HON. SECRETARY: It is on the notice—18s.

The PRESIDENT said they had recently decided that the Junior Associations should have the volume at 2s. 6d.—the same as was charged to the senior members—and he took it the resolution would have to apply to the juniors as well.

The proposition was agreed to.

ANNUAL MEMBERS' TICKETS.

The PRESIDENT next moved—"That, in order to save expense, the annual members' tickets be not issued for 1918."

Mr. WATSON said he would like to suggest that the Committee should take into consideration whether they could possibly issue these members' tickets, and charge those members who ordered them with the cost, so that it would not fall upon the Institution. Personally, he felt it very useful indeed in getting in touch with his fellow members. He did not want to propose an amendment, unless it were to ask that the President should withdraw his resolution, and accept a proposal that the matter be left entirely in the hands of the Committee to consider and decide as they think fit.

Mr. SAMUEL GLOVER remarked that the Committee had arrived at their recommendation after very careful deliberation on the whole position. One of the arguments which carried weight was the fact that there were very few alterations to be made in the names, and that last year's members' ticket would remain correct in perhaps ninety-nine cases out of a hundred. Possibly if a list of the alterations were sent to each member, to enable him to correct his last year's ticket, it would meet the views of everybody.

The HON. SECRETARY said he would be only too pleased to supply to applicants details of the changes; but, for reasons which would be understood, he did not think it would be advisable to have a list printed showing the alterations.

Mr. WATSON: I am not pressing the point.

The resolution was then carried.

APPOINTMENT OF REPRESENTATIVES.

It was next agreed that Mr. J. P. Leather be appointed the representative of the Institution on the Executive Committee of the National Gas Council; that Mr. G. S. Frith be appointed their representative on the Council of the Institution of Gas Engineers for 1918-19; and that Mr. Samuel Tagg and Mr. A. E. Mottram be appointed representatives on the Council of the Lancashire and Yorkshire Junior Gas Associations respectively.

THE NEW PRESIDENT.

The PRESIDENT said that they had now got through the formal business, and had arrived at the point in the proceedings at which he had to vacate the presidential chair. He was sure the members were all delighted that his successor was to be Mr. Leather, of Burnley—a gentleman who was highly respected in the gas profession and who had done much good work for many years past for the industry. He was their representative on the National Gas Council; and he was also on the Refractory Materials Committee. He had done much research work, and been a pioneer in many directions in the gas industry. He had much pleasure in asking him to take the chair.

MR. WHATMOUGH THANKED.

Mr. LEATHER (who was very cordially welcomed on taking the chair) said he must thank them all for the manner in which they had received his name. His first duty was to propose a vote of thanks to the retiring President. This he did with much pleasure. Of course, Mr. Whatmough had not only been a good President during the past year, but he had been for many years a great help to the Institution. ["Hear, hear."] He worked for a long period for them before taking up the position of President. They were all of them glad to see him take the chair; and he did not think they had been at all disappointed at the way in which he had conducted the affairs of the Institution during a difficult year. These difficulties were emphasized in the minutes of the last meeting, by the statement that they were prevented by the times from visiting Mr. Whatmough in his own town. He proposed that the best thanks of the Institution be given to Mr. Whatmough for the way in which he had presided over their affairs during the past year.

Mr. SAMUEL GLOVER said he would like to second the vote of thanks to their old President for the way in which he had led, and guided, and guarded them during his year of office. For a long while, he had observed Mr. Whatmough's useful work for the industry, and so was pleased to see him occupy the exalted position of President of the Institution, which he had held worthily and well. It had been a year

of many anxieties; and Mr. Whatmough had helped them all as a wise and earnest friend. He had done his best for the members in every possible way.

Mr. BREARLEY said he would like to endorse all that had been said with regard to the services of Mr. Whatmough.

Mr. T. DUXBURY (Oldham) also supported the vote; remarking that they all knew Mr. Whatmough was one of the hardest workers in the Institution, the welfare of which he had had at heart as much as any member. He was deserving of their best thanks. When he took on the duties, Mr. Whatmough had very grave doubt as to whether he would be able to keep up with his predecessors; but they were all agreed that he had maintained his position as President of the Institution equally with any of the Past-Presidents.

The vote having been carried with great cordiality,

Mr. WHATMOUGH, in returning thanks, said that it had been a great pleasure to him for many years past to work for the Institution. As Mr. Glover had remarked, the past year had been an exceptionally busy one; but the path had been made very easy, because he had had so much help from the members of the Committee, as well as from the members generally of the Institution. He could only repeat that it had been a very great pleasure to him to do what he could.

Mr. LEATHER then proceeded to deliver the following

PRESIDENTIAL ADDRESS.

I have earnestly desired that the war, which has caused death and suffering to millions of men in the prime of life, and untold misery and death to women and children over so large an extent of the world's surface, might have ceased before I was called upon to deliver this address. The selfish part of this desire is only a small part of the longing which possesses me that the principle of goodwill to men may so take hold of the heart of those who know God, that force may yield to goodwill as the weapon for the overcoming of evil and greed everywhere. It has often been said that we learn far more by our failures and difficulties than we do when all goes easy with us. Without doubt, we have learnt much during the last three-and-a-half years from the specially difficult conditions under which we have had to conduct gas undertakings. I do not propose to recount these difficulties for the purpose of grumbling at the persons or circumstances which have brought them about or aggravated them, though some of them—such as the dirty coal now being received—are worthy of serious attention by this Institution. But it may be well to survey the field of our operations, as managers of an industry which has been recognized in many quarters to be of national importance, in order that we may see in what way recent events have altered our outlook. I do not think that there is in any industry the management of which demands a greater diversity of gifts—commercial, chemical, and engineering.

COMMERCIAL.

In some large gas undertakings, the commercial and financial management is entirely separated from the engineering and works management. This is not only impossible in smaller establishments, but the different departments are so inextricably connected that no engineer in charge of a gas-works can do justice to his position without devoting much thought to the commercial side of his business. Recent years have greatly emphasized this, rendering necessary the formation of the British Commercial Gas Association. The commercial department itself has its outstanding divisions—the purchase of raw materials, the sale of gas, and the sale of residuals. It is in the sale of gas that the greatest value of the "B.C.G.A." is to be found. During the stress of war conditions, it is only in certain limited directions that much can be done.

The war has caused a great demand for gas for purposes where its superiority was not before so generally recognized; but there is no doubt there will be ample opportunities for much greater developments after the war, if we are ready to lay hold of them.

CONSUMPTION OF GAS.

In Burnley, the maximum consumption of gas in one hour is very little greater than it was twenty-nine years ago, when I assumed the management of the undertaking. The maximum consumption in one day has, however, increased by about 80 p.ct., while the annual consumption is two-and-a-half times its former amount. This has been brought about by the more general use of gas for cooking, heating, and motive power on the one hand, while the quantity used for lighting in the cotton weaving sheds has diminished to about one-fourth the amount formerly used per loom. One incandescent burner, supplied with 2 c.ft. of gas per hour under increased pressure, takes the place of the two flat-flame burners then in use. The maximum demand per hour is still between 4.30 and 5.30 p.m. in the winter; but the difference between the demand during the hours of daylight and those of darkness is now not so marked. Friday was formerly almost invariably the day of greatest consumption of the week, because the shops were open somewhat later at night. Now Monday is the greatest, because of the large amount of gas used in heating water on "washing day." The consumption of gas during five hours on Monday morning—7 a.m. to noon—is almost equal to any five hours of darkness in the afternoon and evening in winter. In summer, the consumption during the day—6 a.m. to 6 p.m.—is 60 to 70 p.ct. greater than that of the other twelve hours through the night. Some typical days are given in the following table of summer and winter consumptions.

Hourly Consumption, 1917.

—	Friday, June 22.	Saturday, June 23.	Sunday, June 21.	Monday, June 25.	Friday, Dec. 14.	Saturday, Dec. 15.	Sunday, Dec. 16.	Monday, Dec. 17.
6 a.m. to 7 a.m.	44	30	14	51	202	217	34	228
7 a.m. to 8 a.m.	73	66	27	95	224	228	64	264
8 a.m. to 9 a.m.	73	68	50	121	161	142	81	197
9 a.m. to 10 a.m.	55	71	83	118	104	108	119	86
10 a.m. to 11 a.m.	70	83	122	122	96	111	148	188
11 a.m. to 12 noon	72	82	143	90	118	127	189	179
12 noon to 1 p.m.	101	103	95	137	122	133	175	165
1 p.m. to 2 p.m.	49	83	76	52	76	72	114	104
2 p.m. to 3 p.m.	56	32	26	77	90	69	72	113
3 p.m. to 4 p.m.	48	32	21	75	99	79	85	108
4 p.m. to 5 p.m.	42	42	15	73	249	138	136	224
5 p.m. to 6 p.m.	61	41	30	59	257	195	144	276
6 p.m. to 7 p.m.	56	30	20	59	197	181	170	208
7 p.m. to 8 p.m.	63	33	24	75	207	165	163	203
8 p.m. to 9 p.m.	51	30	30	74	183	156	162	204
9 p.m. to 10 p.m.	50	37	31	54	162	158	151	149
10 p.m. to 11 p.m.	59	38	73	55	163	144	111	124
11 p.m. to 12 p.m.	48	64	50	46	74	112	78	82
12 p.m. to 1 a.m.	34	39	21	18	57	62	68	40
1 a.m. to 2 a.m.	38	27	18	33	54	84	51	70
2 a.m. to 3 a.m.	18	16	26	41	55	21	25	49
3 a.m. to 4 a.m.	16	11	24	38	55	40	46	25
4 a.m. to 5 a.m.	23	13	47	80	63	34	86	79
5 a.m. to 6 a.m.	42	28	92	53	119	42	136	129

Gas is now used for industrial purposes, not only in engines and such irregular demands as cooking, laundry work, &c., but for furnaces working steadily through all the hours of labour, heating iron for bolt-making, annealing, melting metals, &c. The regularity of control and cleanliness render it more economical than any other source of heat for these and for other purposes, such as tempering steel tools, &c. In order to obtain its adoption, gas undertakings should be prepared to illustrate its advantages by suitably equipped show-rooms placed in charge of qualified attendants.

GAS FOR MOTOR VEHICLES.

The use of gas for industrial purposes was rapidly developing before the war, and the readiness with which it can be applied has caused the development to be speeded-up. Its use for motor vehicles has, however, only recently been recognized as practical. This has been due to the high price of petrol, as well as the difficulty of obtaining it. Before the war the great extension of motor traffic had already threatened a shortage of petrol; so that probably after the war we must prepare for a continued demand for as for this purpose. It may be that we shall need to compress the gas; but if the demand is at all considerable, this requirement must be faced. In Burnley, the quantity of petrol used for motor vehicles before the recent restrictions exceeded 250,000 gallons a year. To replace this by gas would need about 60,000,000 c.ft., which is equal to about 7½ p.ct. of our make. A business of this magnitude is worth providing for.

RESIDUALS.

In recent years the number of bye-products directly dealt with on gas-works have multiplied; and this tendency has been greatly enforced by war conditions. It does not need a long life to remember the time when little or no trouble was involved in the marketing of bye-products. Coke sold easily in the neighbourhood. Tar and liquor were sold on contracts for three, five, or more years, to get rid of them. Spent lime found a ready outlet by being given away to farmers.

COKE.

In many places it is now necessary to seek customers for coke. The best customers are evidently those in our own district; and experience shows that by preparing the coke for use, and undertaking its delivery to consumers, a greatly increased local sale can be induced.

TAR.

The disposal of tar to large firms of distillers has tended to encourage a state of affairs in which the distiller, for his own protection, has arranged to avoid competition. The earlier treatment of tar by distillation is, however, not a process which need be confined to large works. The information obtained last year by this Institution indicated that the best financial results are obtained for tar by gas undertakings which distil their own product. In the autumn of 1916, we erected at Burnley a continuous distillation plant (Hird's patent), and have now distilled more than 5000 tons of tar. We are able to obtain four liquid products—viz., crude naphtha, light oil, creosote, and anthracene oil—in addition to pitch and creosote salts (crude naphthalene). We have not, up to the present, sought to extract tar acids or further rectify these products.

Owing to war conditions, the sale of pitch has been a difficulty, which, however, has recently become easier. Nevertheless, after deducting all expenses, and allowing for interest and depreciation, we obtain 80 p.ct. more than the best offer received from tar distillers immediately before deciding to erect the plant. The cost of the plant has been paid out of revenue, and will be entirely recouped in two years' time.

AMMONIA.

It is 45 years since a plant for the manufacture of sulphate of ammonia was first erected at Burnley. At the present day the

number of undertakings which do not treat ammoniacal liquor either by distillation or concentration is comparatively few. It has, however, been a frequent subject of remark that we should be compelled to seek a market for sulphate of ammonia in other countries when it could very profitably be entirely used in our own. The Sulphate of Ammonia Association has, without very much avail, endeavoured to educate the British farmer to its use by competitions, exhibitions, and pamphlets. Under the stimulus of war conditions, now that other forms of nitrogenous manure are practically unobtainable, while the price of our product has been fixed by Government, farmers are at the present time taking all we can supply. It behoves us to be prepared to retain this custom when the war is over—remembering that just before the war we were threatened with the loss of our foreign markets, by competition of synthetic ammonia produced at a very low cost.

Sulphur.

The sulphur compounds in the gas were formerly looked upon as a nuisance, which we were compelled to remove from the gas at considerable expense. With the higher values of sulphur, due to the war, coupled with reduced costs of working by revivification *in situ*, we have been able to show a profit on purification. This, however, is only apparent, as the profit does not cover interest and depreciation on purification plant. At the same time, the cost of purification is not a serious item; and it would be well if more attention were given to reducing to its lowest point the sulphur compounds, other than sulphuretted hydrogen. There is no reason why anyone should be content to supply gas containing as much as 20 grains of sulphur per 100 c.ft.

Cyanides and Retort Carbon.

Other bye-products produced on a small scale are found to have a definite value. Where cyanogen is not present in sufficient quantity to make the erection of special plant for its extraction desirable, it frequently adds notably to the value of spent oxide. It appears, however, to be a somewhat elusive substance—being found in much greater quantity at one time than another. It is a product of high temperature carbonization, and is probably partly due to the decomposition of ammonia in the presence of hydrocarbons.

Retort carbon is not a desirable commodity to produce if it can be retained in the gas; but, if produced, it pays to remove it carefully and preserve it free from dirt. Over a series of years, we produced at Burnley about 1·9 lbs. of carbon per ton of coal; but recently the yield has been much less than this. It is now a Government controlled product, fetching a fair price, though higher prices have been known some years ago.

Works Management—Distribution.

Turning from the commercial department of our undertaking, the remaining work naturally divides itself into management and the erection of new plant. Management, again, has its two branches—manufacture and distribution.

Distribution is closely related to the commercial department, inasmuch as here we necessarily come into touch with our consumers. Care is needed to so work that the convenience and idiosyncrasies of the customer are fully considered. Gas is now used at all hours of the day and night; and the supply should always be maintained. Apparatus is available for putting on branches of any size without disturbing the supply of gas at all, and should be used for all except the smallest mains. If a main supplying a district is to be taken up, and a larger one laid in its place, a bye-pass should be laid each day past the length estimated for the day's work, and consumers supplied, if necessary, from the bye-pass for their day-time requirements. In this, and every respect, the consumers' convenience should be carefully studied.

In a rapidly growing district, it is often preferable to lay a steel main supplying into the low-pressure main through district governors from a high-pressure supply. Some years ago, it was found that a district outside the borough of Burnley supplied by a long length of 16-in. and 12-in. main was subject to considerable diminution of pressure during the times of greatest consumption. The level of the district was 300 to 400 ft. above the gas-works. There was therefore at no time any real deficiency of pressure; but the variations were a source of annoyance, liable to be further aggravated by the erection of more mills and dwelling-houses. To lay a larger main would have entailed considerable expenditure, and the serious disturbance of main roads. A 10-in. steel main was laid for 2600 yards, and an 8-in. for 2000 yards, supplied by Donkin compressors, and feeding by Reynolds governors into the district at three points. At present it is only necessary to work the compressors a portion of the night for boosting purposes; but as the district grows, no increase in mains will be necessary. A slight increase in pressure at the compressors will meet the probable increase in consumption for many years to come. There are two compressors, capable of delivering 50,000 c.ft. of gas per hour each. A smaller one, having a capacity of 20,000 c.ft. per hour, meets all requirements of high-pressure lighting and boosting, except during the hours of maximum demand.

These mains were of Mannesmann tube, with what are known as rigid joints. The joints were made with lead-wool, and were tested by air under a pressure of 50 lbs. per square inch. The joints were tried with soap solution, and no joint was passed if the least sign of bubble or froth was discernible. This is a much more severe and satisfactory test than estimating the leakage by fall of pressure.

Maintenance for the Consumer.

Not only should a gas consumer not be inconvenienced by mainlaying and other operations, but every effort should be made to help him to get the best results from the gas used. Burners for lighting, cooking, and heating, should be cleaned and adjusted without any charge for labour. All mantles and glassware, if provided, are willingly paid for, but often complaints are entirely removed by merely cleaning and adjusting, which service should be freely rendered. Gas undertakings should also be prepared to "indicate" gas-engines, and without any remuneration advise as to defects.

Manufacture.

I have left to the last the central and most important branch of our work. The departments of distribution, bye-products, and commercial management have seen much development of recent years, and are still in a state of transition; but that of manufacture also is not standing still. We are hearing afresh in various ways suggestions that lower temperatures in carbonization are desirable; but the general experience is that high temperatures must be maintained if the best financial results are to be forthcoming.

It is probably true that if we wish to retain the largest quantity of hydrocarbons in the gas the temperature to which the hydrocarbons are subjected should not greatly exceed 1400° Fahr. But after the heavier hydrocarbons have been expelled, the quality of the coke and the quantity of the gas are increased by an exposure to a higher temperature. The problem is, however, not merely a chemical one. If the outside of the retort is only heated to the required temperature of carbonization, it will be a long time before the coal or coke will attain the same temperature. The layers of coke in contact with the walls of the retort are necessarily hotter than the centre of the mass. To carbonize the coal right through in a reasonable time, the retort itself must be at a considerably higher temperature. This means that the material of the retorts and settings ought to be capable of resisting, without change, higher temperatures than we at present ordinarily use.

Fire-brick at such temperatures gradually changes its character, and is liable to deformation and alteration in size. Manufacturers of these materials are now alive to the fact that what satisfied our forefathers is not sufficient for present requirements; and I have no doubt in a very few years we shall see a steady improvement in this respect, as the researches that are now in progress have their natural development.

In the continuous vertical retort we have the combination of low and high temperature. The bulk of the gas is driven off at a comparatively low temperature, and escapes from the retort without undue roasting, while the coke afterwards can be subjected to any desired temperature which the materials of the setting will stand. The possibility of increasing the yield per ton by steaming is also in favour of this construction. But, again, for the best results, a more refractory material is a desideratum.

Scientific Research.

The war has been the means of drawing increased attention to the value to industry of systematic scientific research. It is well that we should realize that research is of the nature of travel in a previously unknown country. We do not always find the thing we look for, for the good reason that it is not there. On the other hand, we may find many good things of which we had previously no idea. The researches into the composition of gas best adapted for general use, and into the qualities of refractory materials, are sure to eventually yield fruitful results. The Committees in charge of these researches are fortunate in the assistance of such men as Prof. J. W. Cobb and Dr. J. W. Mellor. The danger of State-aided research is that those who hold the purse-strings may be tempted to seek an undue share of the credit for the work done by their aid. It is to be hoped that the Associations which are sought to be established by the Privy Council Committee on Scientific and Industrial Research may be controlled by men of wide outlook, who really understand what research implies.

The offer recently communicated to the Council of the Institution of Gas Engineers by Mr. John West, of the use of the gas-works plant at Uddingston for research work purposes, reflects credit on those responsible for it, and will help the progress of the gas industry everywhere.

We should, however, realize that technical research should not be entirely relegated to Committees or Associations, however well directed. Much research can only rightly be done on our own works, by those who are up-against all the problems of practical work; and gas undertakings ought to be so well staffed that there is opportunity for thoroughly investigating the conditions under which varying results are obtained in the processes of manufacture and purification.

Machinery.

Whether gas is made in vertical, inclined, or horizontal retorts, and whether the latter are worked with "full" charges or not, we are likely to see still further increased use of machinery in connection with our retort-houses and coal and coke stores. This does not diminish, but considerably increases the work and responsibility of the management. A machine can only do the work for which it is designed. A man, even a so-called unskilled labourer, is adaptable to different kinds of work and different circumstances. A machine when it breaks down is an inconvenience. Not only does it cease to work, but it often stands in the way of work being done by other means. In a gas-works, no stoppages for break-

downs can be allowed. All machinery must, therefore, be strongly designed, and, if possible, be in duplicate. Skilled labour must be provided for its working and its maintenance and repair.

LABOUR.

This brings me to the much-discussed question of labour. We have with us at present special difficulties, due to the shortage of men caused by the war. Apart from this, however, I venture to express the opinion that, taken as a whole, we have on our gas-works a body of men who serve us well. Many of them work hard at unpleasant work. Compared with the men I remember many years ago, they are steadier and better educated. I do not view the increase of trades unionism in this industry with any alarm. The present time is one of upheaval in many things; and when the war is over, mutual consideration will still be necessary to deal with the different problems which international peace will leave with us, in order that internal peace may be ensured.

Although to the outsider work on a gas-works does not appear particularly salubrious, it is noticeable that many of our men live to a good age. A man who has been brought up to the work is often not too old for the retort-house at sixty years of age, and not a few are advantageously employed on the works at much above this age.

Most undertakings have supplemented the pay of those employees serving in His Majesty's forces, by allowances to dependents, and without doubt will retain in their service all who return from the war. Some will be incapacitated from carrying out their former duties. For them, arrangements must be made to find them suitable work. For example, men who have lost the use of their feet may be taught bench-work.

The thought of teaching brings me to the subject of technical education. The systematic training of gas-fitters by classes has been to a great extent stopped by the war. There is, however, no doubt in my mind that we ought to extend the principle of the technical education of our workmen to every branch of our establishments. A man who works intelligently is always worth more than the man who works blindly, unaware of the real consequence of his acts.

TRAINING OF GAS ENGINEERS.

If, as I remarked earlier, the management of gas undertakings demands a great diversity of gifts, we should seek to train thoroughly those entering the profession. To this end, a thorough education is desirable. If a young man passes through a complete course of scientific study before having any experience in practical engineering, he is at a disadvantage as compared with one who, while so studying, has in his mind the requirements and limitations of practical work. On the other hand, a full knowledge of scientific principles is of great value for an apprenticeship in practical work. These opposing ideas should, I think, be brought into harmony by such a co-ordination of the work of the Universities with technical training as will enable the two to proceed concurrently.

FUTURE OF THE GAS INDUSTRY.

In looking to the future, I think we may be optimistic. The influence of the war has brought the gas industry into prominence, and has helped towards a better and more complete organization of our forces. The three bodies—the Institution of Gas Engineers, the Society of British Gas Industries, and the British Commercial Gas Association—are now more strongly established. It only remains to properly co-ordinate them in the National Gas Council. There is danger of this latter body being looked upon as simply a London organization. It is very important that its national character should be well maintained. In order that this may be so, all districts should be affiliated and work through it, as well as use their influence upon it. In confidence that this will be so, I look forward to a prosperous future for our industry and its increase in usefulness to the community.

OUR OWN INSTITUTION.

We do not look, however, only to other bodies. If all the members of our own Institution are alive to their duties towards it, and the advantages to be gained by attendance at its meetings, the Manchester District will not lag behind in its share of helping forward the onward movement.

VOTE OF THANKS TO THE PRESIDENT.

Mr. S. TAGG (Preston) proposed that the best thanks of the meeting be tendered to the President for his very able address. At no time was the preparation of such an address a task to be lightly undertaken, with the past records of the Institution before one; and he was sure they all appreciated that just now, with the multifarious calls upon one, it was very difficult to devote the attention one would wish to it. He thought the truth of the statement the President made as to the diversity of gifts required for the successful management of a gas undertaking was shown by the address he had just given them; and they must congratulate Mr. Leather on being the possessor of all these successful gifts. Every paragraph of the address revealed the co-ordination of the scientific and commercial spirit; and he was particularly glad to note the reference made to the consideration which should at all times be extended to the consumer. The address bore evidence—were evidence necessary—that the ability with which the Burnley gas undertaking had been conducted would be extended to the work of the Institution during the coming year.

Mr. WATSON said he was pleased to second the motion, and to endorse Mr. Tagg's remarks. They were very greatly indebted to the President for the survey of the scope of work which the gas industry was undertaking, and for the cheery optimism in which they would be glad to share. Mr. Leather was always helpful in giving advice and making suggestions, which he was absolutely competent to do. They were all grateful to him for the help he had given them in his address; and were sure they would receive further help during his year of office. In the last clause of the address, the President referred to the fact that they as members must do their best to help in the work of the industry as a whole; and they would all like to assure him that they would do their level-best individually.

The vote was carried with applause.

The PRESIDENT thanked them very much for the manner in which they had received what he had to say. He felt it was rather difficult to write an address; but at the same time he knew that a very long one was not required. There was not opportunity to get together much information which was new, with the many duties placed upon one at the present time.

Mr. J. R. HILL (Bradford Road, Manchester) proposed a vote of thanks to the Committee and the other officers for their services; and Mr. J. E. BLUNDELL (Macclesfield) seconded.

Mr. WHATMOUGH said he would be sorry for this resolution to be passed without him supporting it, because he knew the work that Mr. Frith had had to do. The last twelve months had been a very strenuous time. They were also greatly indebted to the remaining officers, though the bulk of the work must fall upon the Hon. Secretary.

Mr. FRITH, in returning thanks for himself and his brother officers, mentioned that he had been rather astonished to find that he had sent out over 3000 notices during the past year.

A PROPOSED TECHNICAL LIBRARY.

Mr. WHATMOUGH said there was just one other matter. In Manchester it was proposed to build a new library; and there was a very strong desire that there should be a technical library in connection with the scheme. There was a meeting held a short time ago, at which the following resolution was adopted: "That this meeting of the Engineers' Club affirms the necessity, in view of the future of the industries of Manchester and district, of an adequately equipped technical department of the municipal libraries, and requests the Libraries Committee to make such provision. It also urges the importance of proceeding with this work at the earliest possible opportunity. That a copy of this resolution be forwarded to the City Council and the Libraries Committee." A copy had been sent to various Technical Societies in the Manchester district. He really did not know much about the matter; but Mr. Clayton was present, and would be able to give them full particulars on the subject.

Mr. R. H. CLAYTON (of Messrs. Hardman and Holden) said the suggestion was that the library should contain every technical journal published, and be a complete library for the whole of the Lancashire area. In connection with it, there should be a room for meetings of scientific societies, and probably a small room provided where students could study without being interfered with by the general users of the technical library. The sum required was a considerable one; and it was felt that, if support could be given to the movement by passing this resolution—which had already been passed by other societies—it would very much help to get further space allotted. It was intended to include the literature of other countries, so as to show what was being done elsewhere.

Mr. WHATMOUGH: There is no cost involved to this Institution?

Mr. CLAYTON: None whatever.

Mr. SAMUEL GLOVER moved that the resolution be sent on to the authorities, as suggested.

Mr. H. R. S. WILLIAMS (Altrincham) said there was no doubt a movement of this kind was a good thing. It was impossible properly to carry out scientific research without finding out what had been done in the same direction before. In this library, they would be able to refer to original articles, and see just what had already been accomplished; so that they might take a further step forward on the shoulders of previous workers.

The resolution was agreed to; and Mr. Kendrick was appointed to represent them in the matter.

SUPPLY OF GAS COALS.

Mr. SAMUEL GLOVER, before the members separated, made some remarks (in private) on the general position of the subject of the supply of gas coals.

Committee on the Companies Acts.

The President of the Board of Trade has appointed a Committee (with Lord Wrenbury as Chairman) to inquire what amendments are expedient in the Companies Acts, 1908-17, principally having regard to circumstances arising out of the war, and of the developments likely to arise on its conclusion, and to report to the Board of Trade and to the Ministry of Reconstruction. The Secretary to the Committee is Mr. W. W. Coombs, M.B.E., No. 55, Whitehall, London, S.W. 1.

Pre-War Gas Contracts in France.

The French Professional Gas Syndicate are bringing directly under the notice of members the text of the so-called "Failliot Act," by the terms of which pre-war contracts (such as those in which gas undertakings are concerned) benefit in accordance with the judgment of the Conseil d'État in the notable case of the Bordeaux Gas Company. It is pointed out that the operation of the Act will come to the relief of parties to contracts entered into in pre-war days, when the present exceptional conditions were not within the contemplation of either signatory to the contract and it is suggested that gas companies who hold pre-war concessions, and have hitherto failed in their efforts to obtain from the municipalities compensation or consent to an increase in the price of their gas, should find in the new legislation the opportunity to renew their negotiations with the local authorities.

FAULTS OF ORDINARY DRY METERS.

By A. H. WHITELAW, B.Sc., of the Gas Distribution Department, Glasgow.

[Extracts from a Paper read before the Scottish Junior Gas Association, Western District. Feb. 23.]

Gas-meters have come greatly into prominence of recent years owing to the fact that they are supposed to be more heavily attacked internally now than formerly. The life of the meter is considered to be in danger from such causes as naphthalene, condensation, free oxygen resulting from oxide purification, poor quality of gas, and so on. How far this is true, time will tell. A gas undertaking with a repairing department has a favourable opportunity of forming conclusions regarding meters—especially in a place like Glasgow, where records have been kept for more than 25 years. The information derived from a study of the meter through a range of years is interesting and instructive, making it possible to foretell the number of new meters required for new consumers, and the provision to be made for upkeep and wastage.

When dealing with meters brought in from the district, it is important to know how many are good and how many defective. Figures show that there has been a steady decline of good meters brought in from the district during the past twenty years. A good average for the past ten years would be 24,000 brought in, of which 88 p.ct. were defective and 12 p.ct. good. Probably the chief reason why the good have fallen from 28 p.ct. in 1897 to 4 p.ct. in 1917 is that meters are getting older; and in support of this contention I may say that the average age of the ordinary meters brought in is approximately twenty years. Other reasons can be advanced—such as change of policy, more efficient surveying, overworking meters, poorer quality of gas, and naphthalene and other deposits in the meters.

Bringing in meters from the district is the result of the survey; and the faults marked are bound, not indicating, escaping, not in use, drawing lights, and partial indication. These alleged faults are carefully sheeted. Meters have therefore to go through an initial test in the meter repairing shop so that the real defect may be located. A record of all faults found at the initial testing table is carefully compiled and inserted in the meter register.

From the result of testing about 10,000 ordinary meters brought in from the district from June to December, 1916, inclusive, the following approximation, so far as registration of defective meters is concerned, may be made: 26 p.ct. bound, 21 p.ct. not indicating, 28 p.ct. good registration, 17 p.ct. slow, and 8 p.ct. fast. A falling off in the number of "bring-ins" to the extent of 8000 meters compared with three years ago, is due to the fact that only meters having a genuine fault are brought in, and that meter exchanging has been practically abolished until the war is over. This is an additional and important reason why good meters have fallen from 12 to 4 p.ct. of the "bring-ins" since the war began.

Considering the abnormal times, and remembering that last winter was excessively cold, it was not surprising to find that naphthalene had entered meters. In some cases it was present in handfuls, and in others only as a slight deposit. Quantity, however, counts for nothing, as a fraction of an ounce will do as much damage as a pound. Its effect on the meter is to harden the leather, rot it, and shorten the life of the diaphragm. The gritty deposit on the valve causes the lights to jump through valves sticking; and in a short time they cease to move, becoming embedded and covered with white crystals of naphthalene. When this state is reached the meter becomes bound or not indicating, depending upon whether the valves have remained on their seat or been raised off before finally coming to rest.

Drawing lights [unsteady lights] is a fault which in ordinary times easily heads the list of complaints. The half-inch pressure test required by the Sales of Gas Act for registration and steadiness is a very delicate one; and many good meters have to be rejected for drawing lights, even when tested against the holder at an inch pressure. Although increased pressure frequently steadies the lights, it is well to remember that drawing lights is often the result of overworking; and if allowed to continue, a worse fault is sure to be developed. If the valves are working smoothly and well divided, and the diaphragms are in good condition, steadiness and good measurement should be obtained when passing gas through the meter at pressures from ½ in. up to 4 in.

In the case of a fixed nipple, it can be shown experimentally that, other conditions remaining constant, when the pressure is increased four times the volume discharged is doubled. This rule also holds good for a meter, within limits; so that, if the inlet pressure be quadrupled, the volume passing will be about doubled for a fixed orifice at the outlet. Consequently, if a steady and regular flow of gas is required, a governor should be installed at the outlet of the meter, to ensure a constant pressure.

A meter should for accuracy at its capacity be tested against a holder; the inlet pressure being 5-10ths. Increase in pressure has little influence on the accuracy of new meters, when the flow of gas is restricted to their capacity. Thus a three-light meter whose consumption remains constant at 18 c.ft. per hour under pressures varying from ½ in. to 4 in. should show the same accuracy in measurement at the different pressures. Also a meter passing increasing volumes due to higher pressures in the mains will register correctly when working at not more than twice its capacity.

The author quoted figures of tests on two old meters to show the effect of increased pressures and volumes for a fixed orifice. One was a three-light meter purchased in 1877, which was repaired about two years ago—new diaphragms being inserted; and the other was a five-light meter bought in 1902, and also repaired about two years ago. These and other tests, he said, indicate that the tendency of overworking a meter is to make it go slow and draw the lights; and observation shows that the point where serious error in registration begins will differ for meters of the same size tested under similar conditions. As everything depends upon the internal condition of the meter, we may safely conclude that, after years of working and overworking, no two meters will show like results. Although the meter has reached a high state of perfection, it is not a machine which can be driven with impunity at a reckless speed, but a scientific measuring instrument. Hence when increased supplies of gas are required, larger meters should be installed.

Gas being highly compressible, it is quite evident that the greater the pressure the more gas a confined chamber or cylinder will hold. Hence, the higher the pressure the more gas a meter will deliver at constant temperature, if the volume be corrected to atmospheric pressure. The loss due to compression at 2 in. pressure—the average on the district—is ½ p.ct.; and this must be considered part of the leakage account, being independent of accurate registration. A pressure of 408 inches—1 atmosphere—is required to reduce the volume of gas one-half.

In our own shop, diaphragms sound at 5 in. pressure are retained, no matter how old; but those porous and leaking are replaced by new ones. The main thing, of course, is the quality of the leather, which should be non-porous, pliable, soft, durable, and have no tendency to become dry and cracked. In former years, the long life of the diaphragms must be attributed to the good quality of the gas and to the systematic oiling of the leather. So far as the meter-case is concerned, the charcoal tinned iron of former times is superior to the tinned steel of to-day in its power for resisting corrosion. Those which resist deterioration best are the smallest sizes, due to the smaller surface area exposed to the atmosphere, and to having greater strength than similar structures of larger size. A good quality of paint is essential for preserving tinplate.

When considering the life of a meter, short periods of time are useless, as many purchased forty years ago are still working, and not likely to be scrapped for some time. The date of purchase gives the age of a meter; but when reckoning its life we have to consider the number of times it has been repaired in a given period, and also the nature and cost of the repairs. In a period of twenty years one meter may have been overhauled twice, another once, while a third may have been on the district, constantly at work, without being repaired at all. Scrapping of meters is by no means excessive, and rarely exceeds 2 p.ct. per annum. When undertakings are scrapping about 5 p.ct. of their meters annually, it will be time enough to become alarmed. The fact is most gas concerns are spending too little on the repairing of meters and expect too much from them. The outstanding features of the ordinary dry tin-cased meter are its low cost, high efficiency, durability, accuracy, and cheap maintenance.

DISCUSSION.

Mr. WALTER GRAFTON (Glasgow) gave the results of some of his own comparative examinations. He found that, when he compared 1917 with seven years ago, the bound meters had gone up alarmingly. He noticed that Mr. Whitelaw, in dealing with bound meters, had made no reference to the experiment which he (Mr. Grafton) had instituted, of passing petrol vapour into the meter. It had so far proved very satisfactory; and they had been able to change a meter registering 14 p.ct. slow into a condition in which it was registering quite correctly. How long it would remain in this excellent condition, however, it was difficult to say. The adding of the petrol vapour must be done with care, or damage was likely to follow. Mr. Whitelaw had said that the effect of the naphthalene in the meter was to harden the leather, and threaten the life of the diaphragm. He failed to see in what way it would rot the diaphragm, and thought it might tend to threaten the life of it, if it became liquid, so washing-out the oil in the leather. The paper stated that increase in pressure had little influence on the accuracy of new meters, when the flow of gas was restricted to their capacity. But, unfortunately, Mr. Whitelaw did not take a new meter for his experiment. He (Mr. Grafton) would give figures of a new meter and one carefully adjusted. The experiment was carried out in 1909, and passed the official testing-station as correct. He thought it rather confuted Mr. Whitelaw's statement, and went to show how difficult it was to say that a meter was correct under all distributing conditions, particularly where pressure and volume were considered. The following were the figures:

Initial Pressure. (Tenths of an Inch).	Outlet of Meter Open.	Three Burners Checked.	One Burner Checked.
7/10	Gas Rate Per Hour. 50·0 c.ft. correct.	Rate Per Hour. 12·3 c.ft. 7·9 p.ct. slow.	Rate Per Hour. 5·0 c.ft. correct.
21/10	100 c.ft. 2·3 p.ct. fast.	14 c.ft. 6·6 p.ct. slow.	4·75 c.ft. 7·9 p.ct. slow.
55/10	150 c.ft. 3·6 p.ct. fast.	11·0 c.ft. 4·1 p.ct. slow.	4·6 c.ft. 14·2 p.ct. slow.

Regarding naphthalene, there was a method near completion which would give them no more trouble in the district.

The President (Mr. A. Wright, of Lockerbie) read a communication from

Mr. James M'Ghie (Glasgow), in which the writer said it would be interesting if some of the members more intimately engaged on the manufacturing side would give their opinion on what part the present-day quality of gas was playing in the undoubted increase in the number of diaphragms giving way. Comparatively new leathers were coming in as dry as tinder, and tearing readily. Another point worth the attention of meter makers and repairers was the increasing number of meters returned as leaking at the index. Through the modern tendency to give higher pressures on the districts, and the "oil hunger" of "war gas," the stuffing-boxes were leaking more readily. They could not be packed any tighter without increasing the resistance on the motion wires too much; and there had been no alteration in their design to meet the still more increased pressures which he believed would prevail in the near future. While on this point, it would save many complaints when accounts were rendered if workmen when attending to escapes from meters and indexes would emphasize to the consumers that the escapes of gas in such cases were against the supplier. There was no doubt at all that thousands of meters were fixed annually all over the kingdom which were known to be too small on their rated capacity for the work they were being called upon to do. There was a large field for the more general adoption of meters considerably smaller in bulk, and of not less capacity, preferably named in terms of their capacity. Several of this type, but with the usual old designation for capacity, were successfully in use in the Glasgow area, and had enabled the department to get out of a difficulty.

Mr. Robert Shepherd (Glasgow) also sent in a written comment, in which he said the damage done to the meter by naphthalene was a matter which called for serious consideration, and no plant that would entirely eliminate this nuisance would appear to be too costly. The passage in the paper on the overstraining of meters was particularly interesting at present, when they were hearing so much about low-grade gas and the possibility of companies having to face the installing of larger sizes to cope with the increased volumes required.

Mr. Frazer (Dalmarnock) said he was surprised that Mr. Whitelaw had given them no comparative figures in the way of testing wet meters. With regard to the faults in dry meters, it seemed that 84 p.ct. of the trouble lay in the diaphragm. He supposed that some of the leathers used were from hides supplied since the outbreak of war.

Mr. David Fulton (Helensburgh) said that Mr. Whitelaw made no secret of his favouritism towards dry meters. Yet he told them that only 4 p.ct. of the dry meters brought in were good. The wet meter had one great feature—accuracy. The lower percentage of good dry meters now brought in was to be expected. Consumers generally were using greater quantities of gas year by year; and the meters were too small. As they gradually replaced them by larger meters, he thought the figures would improve. As regarded the gritty matter found by Mr. Whitelaw in some of the meters, he hoped the gas in Glasgow was free from sulphur.

Mr. Whitelaw, replying to the discussion, said it was true that they were having a great deal more difficulty with the bound meters. This was a new development, so far as Glasgow was concerned. Up to a year ago, the inside of the meters was quite free from the present rusting. It could only be put down to the quality of the gas. It was "war gas," and was not by any means as good as in pre-war times. That a very small percentage of meters were damaged by damp was an outstanding feature. The attacks on gas-meters came from the inside. Glasgow had no use for wet meters, and went in entirely for dry ones. Mr. Grafton had questioned the advisability of using such an old meter in experiments as one of 1877; but age had nothing to do with the matter. The 1877 meter was repaired about two years ago, when it had new diaphragms inserted. No two meters would give the same result. Their experience was that, when a meter had passed through the hands of the repairers, it was, if anything, better than a new one. Mr. Frazer had suggested that the leather for the diaphragms had lately been from "inferior" hides; but he did not find there had been any alteration in the leather. The leather supplied to-day was quite as good as in pre-war times. The fault lay in what was attacking it. The passing of petrol vapour through the meters had done what Mr. Grafton had claimed for it; it had really brought meters from 10 to 20 p.ct. slow back to proper registration. But it was as yet too early to say that they would do the proper work in the district.

A NEW BRITISH OIL INDUSTRY.

There was submitted and discussed at a meeting of the Institution of Petroleum Technologists, held at the Society of Arts on Feb. 19, a paper on a "New British Oil Industry," which was in three parts, prepared by four authors.

Part I.

The first section was by Mr. E. H. Cunningham Craig, B.A., F.R.S.E., F.G.S., who drew attention to the different sources from which oil can be obtained in this country by distillation; the only one of these at present utilized being oil-shale. Here, the distillation process is conducted at a high temperature, so as to produce a maximum of ammonium sulphate and solid paraffin wax; while the oil is really in the nature of a bye-product. Of the other sources of liquid fuel, coal yields too little, and is too valuable, to be utilized on a large scale; lignites are not yet opened for development on a sufficient scale; and peat has proved troublesome and expensive to treat, owing to the difficulty of eliminating water. This leaves the cannel coals, torbanites, and blackband ironstones, which are closely associated, and in many cases easily to be obtained.

Many seams of composite nature containing coal, ironstone, and torbanitic cannel are known, and are at present unworked because they are too thin as ironstone to be mined profitably, while there is no sale for them as cannel, and the coal is also too thin to work. Any process which will enable such seams to be mined with a profit—and many such seams are near the surface, and could be cheaply and easily extracted—will increase both the coal and the iron supply of the country, and contribute appreciably to the supply of oil and ammonium sulphate. On the basis of these various deposits—cannels and bastard cannels, torbanites, and blackband ironstones—it is proposed to found a new industry in this country. This industry will be simply the low-temperature carbonization of the material, with the extraction of oil and all bye-products that can be produced in sufficient quantity. There are several low-temperature carbonization processes in this country that have been demonstrated experimentally and upon a fairly large scale; and all have their respective merits, advantages, and disadvantages. It is not suggested, therefore, that any one process should be adopted and applied universally; the particular material to be treated in each district must be considered. The great objection to any low-temperature process is that the maximum production of ammonium sulphate cannot be obtained unless retorting is carried out at a fairly high temperature. On the other hand, working at a high temperature loses the bulk of the light oils, which are cracked, with the formation of large quantities of uncondensable gas. But here the scientific classification of the various deposits to be dealt with comes to our aid.

Dealing with the question, "Will it pay?" the author said that over the whole country it is probable that the cannels and torbanitic cannels can be counted upon to give an average yield of from 33 to 35 gallons of crude oil per ton. This oil will naturally vary in quality according to the nature of the raw material and the method of retorting employed. The petrol percentage will probably vary between 4 and 10, and refining for the purpose of producing fuel oil should yield from 60 to 70 p.ct. of the crude oil. The maximum of ammonium sulphate that can be obtained, calculated upon the nitrogen content of the raw material, is large in many cases—running to over 60 lbs. per ton; but except where high-temperature carbonization is employed, or the residues from a low-temperature process utilized in a producer, the maximum cannot be recovered. Low-temperature retorting alone cannot be expected to yield more than 20 to 25 lbs. per ton. It is therefore difficult to make any estimate of what an average yield of ammonium sulphate for the country would be; but for purposes of comparison let it be taken at from 30 to 40 lbs. per ton of material retorted. The yield of solid paraffin wax cannot at present be estimated; but it is not likely to be so large as in the case of the Scottish oil-shales. The residue from the retorting of cannel is not by any means useless. Though it contains a considerable percentage of mineral matter in the case of the poorer grades, it can be worked-up into very fair briquettes; while the residues from the better grades can be utilized in producers, to give not only all the power gas that is required, but the full yield of sulphate of ammonia. Thus, instead of being a useless expense, the residues may be made a source of profit; and there can be little doubt that it is on the use of the residues that the success or failure of a cannel distillation industry depends.

Indications have not been wanting that the suggested establishment of a low-temperature cannel distilling industry has not been well received in certain quarters; and in discussion much destructive criticism has been directed against such ideas as have been put forward tentatively, as to the scope and desirability of the work. These criticisms have chiefly taken the form of queries as to the possibility of such an industry paying its own way. No objection, however, is raised to the taking of temporary war-time measures to produce a little more oil in this country, in scattered localities, by the utilization of such gas-works as may be able to apportion retorts which could be made suitable by small alterations for the production of oil. Such temporary enterprises would no doubt cease as soon as the immediate necessity for them had terminated. It is quite evident, however, that an industry cannot be started successfully by such piecemeal work; and it would no doubt be possible to show on the results of working that the production of oil from cannels had not been on a really paying basis. The industry, if started at all, must be started on broad lines, and on a large scale.

Part II.

Dr. F. Mollwo Perkin, F.I.C., F.C.S., who contributed the second portion, said that creosote oil from gas-works can be employed as a fuel oil; but the amount which the gas-works can supply is strictly limited. The Government have asked the gas companies to increase their production of tar. This can, indeed, be done, but how? By lowering the temperature of retorting, or, in the case of vertical retorts, passing up steam through the coal as it is being carbonized. But with what result? In the first case, the amount of gas is decreased, and the throughput of coal is also less. Some experiments which were recently carried out in Lancashire in vertical retorts of the Glover-West system, for the Nitrogen Products and Carbide Company, are of interest in this connection. For example, a special coal was retorted at a temperature of 1411° C.; the throughput of coal in each retort being 4·2 tons in 24 hours. The temperature was then reduced to 1194°, when the amount of coal passing through the retort was reduced to 2·6 tons in 24 hours. Although the amount of tar produced per ton of coal carbonized was increased, the net amount produced in 24 hours was much less; and, of course, the same applied to the net yield of gas, which was insufficient for the town requirements.

In the case of steaming, considerably larger yields of tar and gas are obtained. The tar, however, contains very little benzol and toluol; and what there is is difficult to purify, because of the admixture of aliphatic hydrocarbons. Now, in low-temperature carbonization, as already mentioned, large quantities of oil are produced; but this oil contains no benzol or toluol. It is, therefore, useless for explosives, aniline dyes, &c. On the other hand, the lower fractions yield a light spirit which can be employed for aeroplanes and motor-cars. The higher fractions produce fuel oil; the yield in some cases being very considerable.

A few examples were given of the products obtained from different coals carbonized at low temperatures.

Yorkshire Coal (Washed Smalls).

17·5 gallons of crude oil per ton of coal carbonized was obtained.
Yield of sulphate of ammonia—22 lbs.
The oil yielded, on fractionation:

Oil distilling up to 150° C.	3·0 gallons.
Fuel oil	11·0 ,,
Paraffin wax	8 lbs.

Yorkshire Cannel.

Yield of crude oil—70 gallons per ton of coal carbonized.
Yield of sulphate of ammonia—3·2 lbs.
The oil yielded, on fractionation:

Oil distilling to 170° C.	7·4 gallons.
Fuel oil	49·3 ,,

The first fraction was taken up to 170°, instead of 150°, for a special purpose. There was only a small portion of paraffin wax, which was not estimated.

Slack from Bituminous Yorkshire Coal.

Yield of crude oil—24 gallons per ton of coal carbonized.
Yield of sulphate of ammonia—22 lbs.
The oil on fractionation yielded:

Oil distilling to 170° C.	2·8 gallons.
Fuel oil	12·0 ,,
Paraffin wax	not determined.

A Scotch Cannel.

Yield of crude oil—37 gallons per ton of coal.
On fractionation the following yields were obtained:

Oil to 150° C.	1 gallon.
Fuel oil	22 gallons.

A Coal from Spain.

Yield of crude oil—22·5 gallons per ton of coal carbonized.
Yield of sulphate of ammonia—18·5 lbs.
The oil yielded, on fractionation:

Oil up to 160° C.	2·0 gallons.
Fuel oil	13·5 ,,

The author remarked that many more examples might be given, where the yields vary from 20 to 40 gallons of crude oil. From selected cannels, 40 gallons per ton may generally be expected. After distilling off the bulk of the volatile matter from the coal, over 70 p.ct. of the coal still remains in the form of valuable smokeless fuel.

The Staffordshire blackband iron-ore contains large quantities of volatile matter; and it has now been found that this volatile matter can be obtained in the form of oil by low-temperature distillation. This leaves the ore in a form in which it can be smelted to obtain iron. This is another important use for low-temperature carbonization, because in any case before smelting the ore the volatile matter has to be driven off, and why waste the valuable oil? The actual temperatures employed for low-temperature carbonization vary from 450° to 550° C.; but different coals require different treatment. Some will give up their volatile matter at a lower, and others at a higher, temperature. The wear and tear of the plant is with low temperatures less than when very high temperatures are employed. It has for years been known that oil can be produced in large quantities from bituminous materials, and that—more particularly from cannel coal—the yields are frequently very high.

As to the suggestion that cannel coal can be satisfactorily treated in the shale-oil retorts, Dr. Perkin said that personally he would doubt this, unless the retorts were considerably modified. On the other hand, the shale retorts are being worked to their full capacity; and therefore new retorts would require to be built. If we are to build new shale retorts, why not retorts for low-temperature carbonization, in districts where rich cannel exists? The shale-oil process is intermediate between high and low temperature, and does not give as large a yield of oil as low-temperature plants, owing to the fact that the retorts are worked for ammonia recovery. In fact, the recovery of ammonia was the salvation of the shale-oil industry.

From considerable experience, he would put the average quantity of fuel oil obtainable by the carbonization of a ton of cannel at 20 gallons. That is to say, if 15,000 tons of cannel per diem were carbonized, some 300,000 gallons of oil would be produced, or 105,000,000 gallons working the plant for 350 days in the year; and there is also to be taken into account the amount of light oil and paraffin wax produced. The amount of creosote oil produced from a ton of tar varies considerably; but taking it that on the average 40 gallons are produced, and that 12 gallons of tar are obtained by the carbonization of coal in the gas-retorts of the United Kingdom, it will require about 16 tons of coal to produce a ton of tar—that is to say, to produce 40 gallons of creosote oil. On the other hand, by carbonizing 16 tons of cannel, 320 gallons of fuel-oil will be obtained. Furthermore, except to a limited extent, cannel coal is not suitable either for gas-works practice or for domestic use.

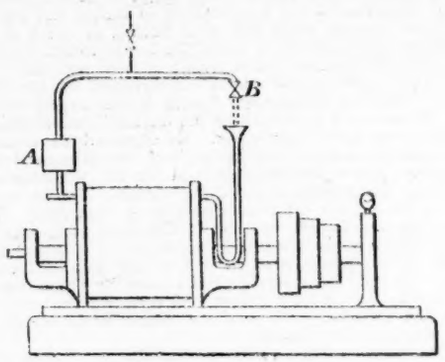
Part III.

The last part of the paper was by Mr. A. G. V. Berry and Dr. A. E. Dunstan, F.C.S., and dealt with the sampling, testing, and retorting of cannel coal; the chemical nature and products from cannel oil; and the refining of the crude oil.

WATER AS A SUBSTITUTE FOR OIL IN THE LUBRICATION OF GAS EXHAUSTERS.

The scarcity and high cost of ordinary lubricating oils having led to the trial of other materials in the case of plant where such substitution is practicable, it is interesting to note the statement, in the "Journal des Usines à Gaz" of Jan. 20, that in three French gas-works water has been successfully used for the lubrication of exhausters for some time past—in one works, for four years.

The following working details are communicated by M.M. Lebon et Cie.: On adopting water as a lubricant, the exhauster requires to be dismantled, and all greasy matter carefully removed. A supply of the purest possible water is brought to the exhauster. It should be town water, condensed water from steam-boilers, or, better still, rain water. The pipe supplying it being fitted with a tap for each exhauster, actual delivery of the water to the working parts is done by one or another of several devices—*e.g.* (1) by



the customary box A, provided with drip-feed and pump; (2) by an ordinary drip-feed lubricator; or (3) by replacing the lubricator by a syphon of the required length, fitted with a small funnel. In this latter case, the water is caused to trickle in separate drops from a gas tap [B in the illustration] with a bit of fine-bore tube fixed to it.

The rate of flow should be about ninety to one hundred drops per minute for an exhauster of a capacity of 6000 cb.m. [about 200,000 c.ft.] per day. In the event of the machine being put out of use, it is well (before stopping it) to introduce 7 to 10 oz. of creosote oil as a preventive of rusting while lying idle.

A test of an electrically driven exhauster, when lubricated by oil and by water, has shown results:

Lubrication.	Oil.	Water.
Power taken up—watt-hours	7500 ..	5000
Temperature, external, of extractor	30° C. ..	20° C.

The mechanical and chemical cleanliness of the water is a point of importance. Suspended matter should be removed by filtration, and choice should be made of water containing a minimum of mineral salts.

A Large Gas-Fired Shipyard Furnace.

The use of gas in shipyards has hitherto been confined to small scale, minor purposes, writes Mr. W. J. Harris, jun., of the Surface Combustion Company, Long Island (N.Y.), in the "American Gas Engineering Journal." But a notable exception is a plate and angle furnace used in a yard on the Pacific Coast. The inside dimensions are 36 ft. by 6½ ft., with a rise of 2 ft. 10 in. at the crown of the arch. Gas is supplied at 10 lbs. pressure by a rotary motor, through a one-pipe distribution, with automatic proportioning of gas and air, and temperature adjustment by one valve. The operating heat ranges from 1800° Fahr. for heavy to 2000° for light work; and as the weight of metal heated is small, compared with the size of the furnace, the consumption of gas does not greatly exceed that necessary to maintain the temperature of the empty furnace. It varies from 45,000 to 50,000 c.ft. per working day of fifteen hours, the cost of which, at the local rate of 2s. 4½d. per 1000 c.ft., is £5 7s. 6d. to £5 18s. 9d. per day. The displaced oil-furnace, which was 6 ft. shorter, required 490 gallons of oil per fifteen hours, which, at 3d. per gallon, cost more than gas, and at the current rate of 4d. exceeded £10. The burners are connected in pairs, and the number used can be varied to suit the size of the work to be heated. If only 15 ft. long, the front half of the oven can be used; and, under such conditions, the temperature at the back is only 200° lower. So that, if required, the whole can be quickly brought up to working temperature.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. Garsed on the Working of Vertical Retorts.

SIR,—I have been reading Mr. E. Garsed's Presidential Address to the Yorkshire Junior Association in your last issue, in which he takes up considerable space on the question of the carbonization of coal in vertical retorts. In my opinion he has given some very misleading and erroneous opinions or statements respecting the subject.

I learn that this gentleman is Secretary of two small gas companies —one manufacturing 4½ millions, and the other about 15 millions per annum. From this it does not appear that he has had any practical experience on this very important subject which he has been so elaborately writing about. Therefore I consider that his remarks are not of any practical value.

I pointed out in the "JOURNAL" only a few weeks ago that, as far as the Glover-West system was concerned, all kinds of fatty and lean varieties of coal had been tested in all parts of the United Kingdom, and abroad, without any difficulty whatever, where the rules laid down for the proper working of the system had been systematically carried out. Consequently, I wish to emphatically state that Mr. Garsed's remarks cannot apply to our system; and I am at a loss to understand why they should apply to any system of vertical retorts if proper care and supervision are taken in looking after the working of the plant. But the cases he has referred to appear to me to have received not even the slight care and attention that are necessary in working any kind of vertical retort. Only very recently I have given much practical and satisfactory evidence of the advantage of the vertical retort system; and from those engineers who are actually operating them, nothing but praise and good results are continually being sent to me. There is again in your issue of this week (p. 400) another good account of their advantages, as I know from experiments that have been most carefully worked out by our friends in America.

I asked Mr. Wilfred Tallentire, of Lurgan, who has at work one of our small plants, if he had read Mr. Garsed's address; and I received this letter from him this morning:

> I have read Mr. Garsed's address as given in the "GAS JOURNAL" for Feb. 26, and was amazed at his remarks on vertical retorts, which are incomprehensible to me. There must surely be some want of attention, for I have been working with the Glover-West vertical retorts for the past six-and-a-half years, using various coals, good and bad, English, Scotch, and Welsh, and have never met with the difficulties he mentions. "Hanging" is almost unknown; all coals working equally well in that respect. In fact, if the plant receives proper attention, everything goes as regularly as clockwork. From the beginning, the results obtained have far exceeded our expectations. Since the "steaming" process has been adopted, the make per ton of coals carbonized has been on an average 17,500 c.ft., and 550 B.Th.U., with an increased yield of tar and liquor. I could say a great deal more, but time presses. Personally I am more than satisfied, and have found my work simplified in every way since I got them.

Really I do not think it necessary to add further testimony to prove that there is something wrong in statements such as those of Mr. Garsed, that run counter to so much practical experience.

Southport, March 2, 1918. JOHN WEST.

Genesis of the Continuous Vertical Retorts.

SIR,—Mr. E. Garsed's presidential address to the Yorkshire Junior Association was very commendable to his hearers, and is more so to readers of the "JOURNAL," in that it reveals the doubts which have arisen in Mr. Garsed's experience with continuous verticals and vertical retorts generally. But it also raises what he rightly imagines would aid to the cures of the obstructed downward flow of coal in charges attended by the baneful stoppages of operations in gas production.

The suggested passing into the retort of from 6 to 7½ lbs. of coal per minute is in the cycle of thought—without any difference whatever—in what was actually proved at Exeter fourteen years ago by the Settle-Padfield process.

If Mr. Garsed will turn up the "JOURNAL" for Jan. 12, 1904, p. 80, and read what follows the title—viz., "The Coming of the Vertical Retort"—he will find contentment of heart without any further wonder, or search, for what he evidently thinks is still lost and unproved. Mr. Garsed will also find the most substantial support available by reading the pages dealing with the Settle process in the late Prof. V. B. Lewes's book, "Carbonization of Coal."

Leeds, March 2. T. SETTLE.

Harrogate Gas Company.

The half-yearly meeting of this Company was held on Wednesday last, under the presidency of Mr. Francis Barber. The Directors reported that the profit for the year 1917 was £14,355, which added to the net balance brought from the 1916 accounts (£16,459) made an amount of £30,814 available for distribution. After providing for the interim dividend paid last year and interest on the debentures and preference stock, there was a sum of £22,028 at the disposal of the ordinary shareholders. The Board recommended dividends at the rate of 17½ p.ct. on the "A" stock, 15 p.ct. on the "B" stock, and 14½ p.ct. on the "C" stock. These totalled £5422, and left a balance to be carried forward of £16,605. To meet the increased cost of living, the Board have granted advances to the Company's employees, as war bonus, amounting to upwards of £4000 per annum. They state that the prices of essential materials used on the works have increased from 17 to 33 p.ct. on the prices paid in 1916. The quantity of gas made last year was approximately 364 millions, of which nearly 331½ millions were sold. It was estimated that motor buses running in the district had used nearly 2½ million c.ft. of gas since the Company commenced the supply of gas for traction purposes.

REGISTER OF PATENTS.

Gas-Fired Pottery Furnaces.—No. 112,365.

YATES, H. JAMES, of Aston, Birmingham, and BRAYSHAW, S. N. & E. R., of Hulme, Manchester.

No. 6008; April 28, 1917.

This invention relates to gas-fired furnaces provided with a regenerative chamber around the walls in direct communication with the interior of the furnace, wherein the burners only are placed, while the pipes and fittings are all outside the wall. Thus the burners only become heated, while the gas and air fittings remain cool. The burners are disposed at the top or bottom of the sides of the furnace, or both; and there are corresponding outlets for the waste gases opening direct into the regenerative chamber, "whereby a high and even heating of the interior of the furnace is obtained from gas and air at comparatively low pressures."

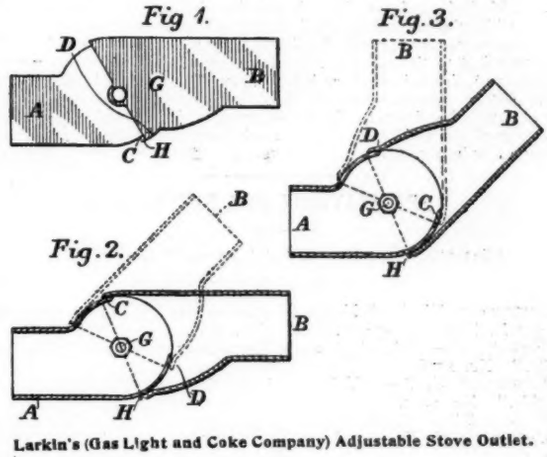
The invention is not described except with reference to six sheets of drawings, which accompany the specification.

Elbows or Bends for Flue-Pipes.—No. 112,814.

GAS LIGHT AND COKE COMPANY and LARKIN, F. S., of Harwood Terrace, Fulham.

No. 1235; Jan. 24, 1917.

In patent No. 105,304 is described a device for gas-fires comprising an angularly adjustable reversible flue outlet nozzle directly connected with, and adapted to turn through 90° about, a curved or partly cylindrical part, itself forming the discharge branch or outlet flue of the gas-fire. The present invention relates to elbows or bends which, besides being adapted to be fitted to existing outlet flues of gas-fires and other heating apparatus, are applicable to pipes generally (other than flue outlets) with which an adjustable elbow or bend is desirable.



Larkin's (Gas Light and Coke Company) Adjustable Stove Outlet.

Fig. 1 is a side elevation of the elbow or bend; fig. 2 is a sectional side elevation; fig. 3 is a similar view, but showing the right-hand section in reversed order.

The bend is formed of two separate tubular sections A B, of any preferred cross sectional shape. Each is provided at one end with an enlarged portion C D in the form of a section of a cylinder or drum—one fitting within, or co-operating with, the other. They are pivotally connected centrally at their ends at G. The enlargements C D are of sufficient size or angular measurement to permit of a relative movement of the members A B of 90°—that is, from a straight or horizontal line indicated by full lines in figs. 1 and 2, to a right-angle bend shown in dotted lines in fig. 3. The sections are reversibly connected so as to permit one portion of the angular movement of adjustment to be obtained when the members are connected in the manner indicated in fig. 2, and another portion of the angular movement when one of them is reversed—fig. 3. A stop H is provided to lock or limit the movement of the sections A B in any desired relative position.

Mixing and Controlling Air and Gas for Pressure Heating Burners.—No. 113,032.

WALLWIN, J. M., of Salford.

No. 4628; March 30, 1917.

This invention relates to burners of the kind in which the gas and air are led, by separate converging conduits, into a conical cap having apertures round its wider end through which the combustible mixture escapes into the burner head.

One or more perforated hollow cones are fitted within the burner, being perforated over their entire surface, and arranged with their apices nearest the burner head. Generally, only one cone will be employed. The taper of the cone is preferably equal to an angle of about 70°; so that the sides of the cone will produce between them and the parallel sides of the conduit an angle of about 35°. As the air and gas pass forward to the burner head, they have (of necessity) to pass through the holes in the cone, and in so doing are divided into a number of small streams. In issuing from the cone, the streams of gas and air are mechanically directed against the sides of the conduit,

and by them are, in turn, thrown back diagonally towards the centre of the conduit. In this way the air and gas become intimately mixed before reaching the burner head.

Distillation of Oil Shales.—No. 112,997.

Heyl, G. E., of Kingsway, W.C.

No. 1805; Feb. 6, 1917.

According to this invention the shale is steeped for a considerable period (say, 24 hours) in the liquid hydrocarbon before being distilled with it. Also the distillation is preferably effected in two or more stages—a proportion of the liquid hydrocarbon being added to the shale between the stages. A small volume of liquid hydrocarbon relatively to the volume of shale will, it is said, suffice for the operation.

Using, for example, coal-tar oil which distils at about 220° C., a volume of oil equal to 10 p.ct. of the mass of the shale is used first to wet the shale, and the mixture is distilled up to, and at a temperature of, 220° C. The residue remaining in the still is then allowed to cool, and another 10 p.ct. of the oil is added, and the mixture is distilled to about 400° C. The net yield of oil obtained by this process, after deduction of the added 20 p.ct. of coal-tar oil, will, it is claimed, be greater than is obtainable by distillation processes hitherto employed.

Destructive Distillation of Bituminous Coal. No. 113,079.

Blythe, F. C., of Southsea.

No. 15,728; Oct. 29, 1917.

In patent No. 19,750, of 1914, the same inventor described a method of increasing the yield of hydrocarbon oils by the distillation of bituminous coal, by adding to the coal a certain amount of heavy hydrocarbon oils and distilling under pressure at a comparatively low temperature—the object being to avoid or hinder the "cracking" of the oils, and thus decreasing the amount of the permanent gas produced by the ordinary system at the expense of the liquid hydrocarbons.

By this so-called "new mode of working," the added heavy oils act as "a kind of regulator of the destructive distillation of the bituminous coal, while the pressure applied to the mixture allows of a more intimate contact—thus greatly facilitating the action of the regulator."

According to the present invention, there is added to the coal the necessary hydrocarbon oil, and the mixture is heated as described in the 1914 patent. After a suitable time (for example, when the desired temperature has been reached), the pressure is released, and the distillation of the volatile matter is carried on either under atmospheric pressure or in a vacuum.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 27.]

Nos. 2808—3267.

Anderson, W. J.—"Means to ensure more effectual consumption of gas for illuminating purposes." No. 3061.

Brown, A.—"Lighting or extinguishing gas-lamps automatically." No. 2816.

Burridge, G. A.—"Valves and taps for controlling the flow of liquids." No. 3165.

Climie, W.—"Gas-producers." No. 2994.

Crossley, Sir K. I.—"Internal combustion gas and oil engines." No. 3090.

Cunningham, W.—"Coke-oven doors." No. 3258.

Firth Blakeley, Sons, & Co.—"Operating vertical gas retorts." No. 3240.

Gilbert, J. L.—"Indicating or recording the flow of liquids." No. 3003.

Haynes, T. H.—"Synthetic production of ammonia." No. 2914.

Hjort, V. F.—See Gilbert. No. 3003.

Kimber, W. E.—"Retort for treatment of oil shale." No. 3173.

Lea, D. H. & F. M.—"Bunsen burners." No. 2882.

Macdonald, D. & R. F.—"Electrolytic gas process." No. 2877.

Mackenzie, J. W.—"Electric gas-lighters." No. 2953.

Marks, E. C. R.—"Simultaneously producing gas from lignite and other combustible materials and calcium phosphate for agricultural purposes." No. 2924.

Michell, A. G. M.—"Determining the viscosity of fluids." No. 3124.

Moorhouse, L.—"Carbonization and distillation of coal, &c., by electricity." No. 2878.

Murphy, S. J.—"Feeding high-pressure gas automatically to internal-combustion engines." No. 3005.

Nitrogen Products & Carbide Co.—"Destructive distillation of carbonaceous materials." No. 2920.

Palmer, T. C.—"Retort for treatment of oil shale." No. 3173.

Perkin, F. M.—See Nitrogen Products. No. 2920.

Safety Gas Lighter Corporation.—See Mackenzie. No. 2953.

Shaw, E. J. A.—"Operation of vertical gas-retorts." No. 3240.

Simpson, C. W.—See Moorhouse. No. 2878.

Smith, D. J.—"Scrubbers, cleaners, and coolers for gas." No. 2832.

Scott-Snell, C.—"Automatically controlling gas, &c., supply in lighting and heating, &c., installations." No. 3191.

Soc. Anon. Italiana G. Ansaldo & Co.—See Marks. No. 2924.

Thompson, E. C.—"Solutions of sulphuric anhydride." No. 3245.

Tondeur, R.—"Carburetting air." No. 2861.

Williams, W. M.—"Synthetic production of ammonia." No. 2914.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Progress of Bills.

In the cases of the Basingstoke Gas Bill, the Alliance and Dublin Gas Bill, and the Rhymney and Aber Valleys Gas and Water Bill, it was reported by the Standing Orders Committee that the Standing Orders ought to be dispensed with, and the Bills allowed to proceed.

The Basingstoke Gas Bill has been read the first time, and ordered to be read a second time.

Supply of Oil in this Country.

Captain Barnett asked what had been done to increase the supply of petroleum in this country from the distillation of shales, cannel coal, and other material of the same kind. They were told now that the Ministry of Munitions had found it possible, under the Defence of the Realm Act, to seek for petroleum without legislation. They were far more likely to find petroleum in this country by dealing with shales and lignite and with cannel coal, than by drilling. The finding of oil in the distillation of shales and coal had been considered very carefully by the Institution of Petroleum Technologists. A series of papers recently read before the Society showed that considerable attention had been given by experts to the problem of the distillation of these shales. Cannel coal was an even more profitable source of petroleum than the shales; and it could be obtained also from blackband iron stone. He asked that attention should be concentrated on these two sources. Continuing, he said: The Government have recently asked the gas companies to produce more tar, and another Department of the Government simultaneously have been asking the consumer to use less gas. I do not know whether this is an instance of the want of co-ordination of which we have heard. But if less gas is to be made, there would be less tar. The two things go together; and it seems inconsistent in one and the same breath to tell people not to use so much coal gas, and at the same time to press the unfortunate gas companies to produce more tar for the purpose of getting petroleum from it.

Sir Worthington Evans (the Financial Secretary to the Ministry of Munitions), in reply, said the Government were taking steps which he believed would bring about production a great deal quicker than was likely to be the case from retorts put up at the mines. Under the very capable advice that the Ministry were following, they were setting-up at various gas-works throughout the country some additional machinery, which enabled cannel coal to be distilled in the ordinary retorts at the gas-works. This gave them a very great advantage. No new retorts were required. It was quite true that some extra boilers and plant were needed. But existing staffs at the gas-works were available; and they did not have to create a new staff at the mines. The sidings and the labour were there. They did not have to put new sidings at the mines, or even have to use new labour, because the labour at the gas-works was available. Moreover, instead of wasting bye-products, they were being treated at the gas-works themselves; and the gas which was produced from the distillation of cannel coal was available for illuminating or heating purposes, in addition to recovering oil from distillation. During the next month or two, there would be several of these modified plants actually working. Subject to the limit of materials and labour, there was not the slightest reason why all the cannel coal that was now being raised in the country should not be treated in existing gas-works. It was not truly what was known as low-temperature distillation; but he did not want to go into the technical details.

Eastbourne Gas Company.

Presiding at the meeting of this Company yesterday week, Mr. J. C. Towner, in moving the adoption of the report, said that at their past half-dozen meetings it had been his task to explain the action of the Directors in continuing the policy of using up the resources and reserves of the Company and to keep back advances in the charge for gas until *force majeure*, so to speak, left them no alternative. Little in the nature of reserves now remained, and their accounts indicated that steps were taken six months ago to level-up the receipts to the expenditure and to meet expenses out of revenue. In this they had succeeded, aided by an increase in the sale of gas to the extent of 20,500,000 c.ft. (equal to 8 p.ct.). The dividend payable under the sliding-scale (together with banker's interest), amounting to £6896, had been earned; and there was £2547 to carry forward. The gas sold had been 275,976,300 c.ft., against 255,463,200 c.ft. in the second half of 1916. This exceeded by 8½ million c.ft. the previous largest half-year's sale, which was in the first half of 1915. The consumers now numbered 5645 ordinary and 6119 slot-meter customers—making a total of 11,764, or an increase of 145. Cooking seemed ever to increase, as shown by an addition of 243 to the hired stoves—making a total of 10,045. Showing how the war had heaped up costs, he said that coals and gas oil had cost £41,007, as against £37,659, or an increase of £3348. Wages had grown from £10,035 to £12,925. Considerable sums had been expended in retort-house repairs and the construction of sulphate of ammonia plant. In conclusion, he paid tribute to the strenuous services of Mr. Garrard, Mr. Hammond, and the staff generally; and later a formal vote of thanks was passed to all "who in these anxious days have rendered such earnest and loyal service to the Company."

More Gas Sold at Romford.—As compared with the corresponding period of 1916, the sale of gas by the Romford Gas and Coke Company, Ltd., for the final half of last year shows an increase of 18·79 p.ct. At the meeting on Saturday, the Directors reported that the revenue profit carried to profit and loss account was £3711, which, added to the balance brought forward, made an available total of £7752. The Directors recommended dividends at the rates of 6⅔ p.ct. on the original shares and 7⅓ p.ct. on the "B" shares (both less income-tax), which would leave £4168 to be carried forward.

MISCELLANEOUS NEWS.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine, F.C.I.S.), read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

GAS DEMAND AND PRICE.

The CHAIRMAN, in moving the adoption of the report and accounts, said the first item of the report was one which should give much satisfaction to any body of gas proprietors. It was that the increase in the sale of gas had been 5·9 p.ct. This might have been easily doubled if the Company had only been allowed to have the plant necessary to meet the consumers' wants; and when once they got clear of bureaucracy, which at present regulated them both in the purchase of materials and the sale of manufactured residuals, there would be a very considerable future before the Company. One of the lessons of this war time, particularly of the last two winters, had been that the general public wanted a great deal of fuel in the shape of gas, especially if they could not get coals, which, however, were now being supplied more abundantly for household purposes, and at lower prices, than perhaps might have been considered possible under the circumstances. It was rather a melancholy thing to have to tell the proprietors that the Directors had had not only, as foreshadowed in the report presented at the last meeting, to increase the price of gas to the extent of 4d. as from Michaelmas, but again at Christmas they were forced, by the action of the Coal Controller in raising the price of coal from some time anterior, to increase the price of gas by a further 3d.—the charge being now 1s. 1d. per 1000 c.ft. higher than before the war. As the price had been raised during war time by certain of the important London companies by 1s. 4d., and the Wandsworth starting-price being a lower one than in the Metropolis generally, he thought the proprietors would see that there was nothing in their own increase to complain of so far as the consumers were concerned. And in regard to the stockholders, the dividends the Directors recommended, if not equal to what they had been in the past, were not so acutely cut down as to furnish a very great reason for dissatisfaction. They could not understand why the last 2s. 6d. per ton was put on the price of coals, which had been depreciated so seriously in quality that really he thought they should have had a reduction of 2s. 6d. instead of an addition of this amount. They had been told that this did not go into the coal owners' pockets; so he supposed the surplus profit was going into the Treasury. He hoped it did, because it was a hard burden for the consumers to bear. To-day they had to think a little more of the consumer; and if those who imposed all these cost burdens upon gas undertakings in raw materials and wages would consider that they fell very largely upon the consumers, it might have the effect of holding their hands somewhat. It would be seen that the revenue account showed a profit; but they had not earned the dividend at the full statutory rate by £984. This was largely at the old price of coal; and so it would be seen that, with the 2s. 6d. extra on the price of all their coal, if they did not charge the consumer another 3d., the £984 deficiency would be greatly enhanced.

DISAPPOINTMENT OVER NEW PLANT.

Their difficulties had been very largely caused by the fact that before the war the amalgamation had brought a large increase in the demand for gas; and they had prepared plans for new plant, including retorts, which would have enabled the Company to give the coal gas—not substitutes—which for the largest part they had generally traded on, which was the kind of gas the consumer liked best, and which was the most profitable for the gas company. But then the Treasury warned them that they were not to call up any capital. With the war before them, they could not tell that coal was going up in price so tremendously to the consumers, and that supplies would be so difficult to get, nor that they were going to have such severe winters. They hoped, in fact, that the war might diminish the rate of demand upon them, so that they could dispense with this plant. It had all gone the other way about; and they had wanted the plant for the rapid growth of consumption more acutely since the war than before. Now their efforts to obtain plant were met by serious objections by the authorities; and those who issued permits for material to be bought, so that the contracts could be entered into, had turned down the scheme, by which they had hoped to utilize some of the land which for a long time they had had ready for extensions—land unrivalled in position, because it abutted on to the Thames. The Company had, in effect, turned the borough of Wandsworth into a seaport by bringing ships up to it. In the circumstance of not being able to get new material, their Engineer had been very busy in purchasing second-hand goods. This had been most advantageous and useful to them; but it had not quite met the case of providing the increased quantity of gas they so badly needed. Mr. Carr seemed to know a lot of old iron dealers [laughter]; and he had got hold of barges, winches, boilers, tanks, pipes, dynamos, and stove parts. But all this did not give them the extra plant they wanted for carbonizing coal. If they had known what enormous value their products—the benzol, the toluol, and the acids—were going to be to the country, they could at first have put some pressure on the Treasury; but they were not called upon for these products until some time after the war commenced. Materials of all kinds which they required were most difficult to get, as was reflected by the wear and tear account, about which he was very anxious and very careful. It would be seen what large figures were represented by wear and tear, and these not on account of the extent of the work, but owing to the large price that had to be given for materials and labour. This was all very hard on the consumers. With the old machinery, they had had to put up with a limited supply of gas, and at the higher price the Company had been compelled to charge of late years. The Company also were sad losers by all these things. The Government not only, in effect, decided what their prices for gas should be, but they diminished their output of gas by refusing the needful plant. They also called on them for additional services, and extra materials for national use; and upon this they regulated the prices for residuals—lately coke among the rest. They controlled the export of residuals. They put 4s. first upon the price of coal, and then 2s. 6d.; but worse had happened through vessels being taken by the Government, causing high freights. The position of shipping had very largely restrained their ability to recoup themselves by getting better prices for residuals. These were all consumers' questions, as well as proprietors'; and he was anxious to let the consumers know of their difficulties. They had been extremely tolerant and forbearing. They put up with a large amount of privation; and he believed they, to some extent, sympathized with the Company's position.

BANKERS' LOANS AND THE BILL IN PARLIAMENT.

The Company owed a considerable amount of money to their bankers. This was inevitable, because their stores were costing them much larger figures than formerly. If the proprietors looked at the balance-sheet, they would see the working capital had increased enormously. The temporary loan had gone up from £193,000 to £333,000. This was largely made up of the extra value of things—for instance, stores, £44,000; the new ship, £96,500; and the debit on capital account was £17,000 extra. They must keep going; and they must get money, as the Treasury had interfered with the Company raising it in the usual way. But the bankers would not, or could not, go on for ever lending them money; so the Company had promoted a Bill in Parliament to obtain capital which would not be permanently burdensome. The present confidence of investors involved that they should give 5 p.ct. or over for borrowed money, and 6 p.ct. for preferential money. The Bill was to give the Company power to raise money in this way, to be repayable in a few years, so as not to form a permanent burden of dear capital.

SHIPS AND RAIL.

Speaking of the new ship, their position in supplying gas so cheaply—they were down to 1s. 9d. before the war—was due to the fact that they had been the pioneers in ships carrying coals penetrating the bridges right up to Wandsworth. The proprietors would be grieved to learn—it was a heartfelt loss to him (the Chairman)—that their brave little "Wandle," which had the fight with the submarine, had been lost through the absence of light on the coast, and had gone on the beach at Flamborough Head, and could not be salved. The flag of the "Wandle," by the way, was now in the Town Hall at Wandsworth; and it would be remembered that the captain had a medal for what he did on the occasion that his boat fought the submarine. Of the two vessels they had running before the loss—the "Wandle" and the "Mitcham"—the former was the most active, and ran more trips to the North than any other collier. They had since bought a large new steamer—the "Lightfoot"—for £96,000. But she could not penetrate the bridges; and every ton of coal she carried meant an extra tax on the Company for unloading and barging up the river, which cost them something like 2s. 6d. per ton. They had another boat the "Ewell." It was bought by their Engineer's exertions, at a reasonable price. They gave £16,000 for her; and she would fetch £60,000 in the market to-day. This brought another expense upon them, because the "Wandle," which cost £13,000, was in these times worth £45,000. But all extra value had to be insured against, and they were paying for the bare insurance of their ships from the North something like two or three times as much as the whole business of shipping and insurance used to cost the Company. At the present time, another difficulty was that the bringing of coal to London by ship was actually dearer than conveying it by rail. But unfortunately railway traffic had come to its limit. Though one large suburban gas company was now supplied by rail, it had exhausted the last limits; for now the railway companies said they had no sidings, locomotives, or wagons to spare to bring along more coal. Therefore, any attempt to evade the extra cost of the sea by going to rail, was out of the question. Moreover, the Company's lay-out was for handling coals in bulk by ship; and when they went to empty coal-trucks, it meant labour that they could not find at Wandsworth. Last spring they tried female labour for work of the kind; but they found that, the coal-trucks being so high, the work was too laborious for women to undertake.

UNCERTAINTIES AND THE LABOUR POSITION.

Turning to the accounts, he would not take the proprietors through them in detail. They were very simple. But at a time like the present, it was not much good making comparisons of costs with previous periods or prophesying what they would be in future. The gas industry was faced by the Federated Union of Workers for extra wages or percentages, based upon what Mr. Winston Churchill did in connection with certain of the time workers in munition factories. He (the Chairman) had been informed by the Chairman of one of the largest gas companies in London that the new demand would mean to them a cost of over 5d. per 1000 c.ft. of gas sold; and if it were so for that Company, it would be 6d. for their own, because the other company was four or five times the size of theirs. This would necessitate the raising of the price of gas again.

POINTS FROM THE REVENUE ACCOUNT.

Regarding the revenue account, they had received £53,201 more for gas, and roughly £1000 more from the rental of meters and stoves. In this connection, he must point out that, all the way through this hard period of war, the confidence of the consumers in the assistance that gas could render them had been shown by their extraordinarily voracious appetite for stoves. The Directors considered that at all risks this ought to be met. Although the stoves were difficult to get, they had fixed a large number; and in the future, they would gather a very rich harvest from this expenditure. The extra receipts for gas and rental from meters and stoves made together £54,228. Their residuals had produced £12,795 more, which made the total additional receipts £67,007. The war food bonus had gone up by £12,779, which swallowed up within a few pounds what the residuals had brought in extra. The increased cost of coal was £37,635, and of

repairs to works £7881. This latter increase was more a matter of prices than of work done. The total additional cost under manufacture was £46,505. When this was set against £54,228 extra income, it would be seen that they were left with some £7800 of improvement out of these large figures. The actual profit, however, was larger by £8472; and the difference between the £7800 and the £8400 was made up of small economies in expenditure. One of these was a very unfortunate saving. It was a saving in the profit-sharing; and nothing was more unfortunate in connection with their conditions through the war than that they should have been brought to the position when they could no longer give their men the share of profit to which they had been accustomed. Nothing could have been more unfortunate or more grievous. However, they had not made the dividend by £984; but it could not be said to be a bad condition, looking to the position of other gas companies. At the same time, it was not pleasant for the Board to find that they had lately had to trench upon the reserve fund, as they had to do last half year to the extent of £10,862. There was thus no choice in the matter but to raise the price of gas by the further 3d. Whether they had reached the top of their misfortunes and difficulties, he could not say. Whatever was before them, they would face it with good heart, and keep the district supplied to the best of their ability. If they had to raise the price of gas again, he should be very sorry, because it would affect the dividends, and still more the consumers. The Board, however, would only increase it at the point of the sword, and as a last extremity.

The Deputy-Chairman (Mr. R. Garraway Rice) seconded the motion.

Mr. Charles Webb remarked that the Directors had had a very strenuous time; and he was afraid that more difficulty yet was coming on. Still he believed the Company would carry on the same. There was one question that occurred to him. They were paying a largely increased price for coal; and he should like to know whether it was the same or an inferior quality to what it was in pre-war time.

The Chairman replied that they were paying a much heavier price for a very inferior quality of coal. There had been in it something like 2 cwt. more rubbish per ton than was usual in normal times.

Mr. Webb said he also noticed that there was a large increase in the quantity of coke and tar in store. Was this also due to the Government?

The Chairman said the increased quantity of tar in store was due to their having prepared it for road use; and then the Government stopped its use for that purpose. This, however, had been altered since.

Mr. Webb added that gas undertakings had done such good service for the Government that he did not know what the latter would have done without their assistance. In view of this, he thought the attitude of the Government towards gas undertakings at the present time was a very unkind way of showing their gratitude.

The motion was unanimously carried.

The Dividends.

Proposed by the Chairman, and seconded by the Deputy-Chairman, dividends were declared at the statutory rates per annum as follows: On the Wandsworth "A" stock, £6 15s. p.ct.; on the Wandsworth "B" stock, £5 5s.; on the Wandsworth "C" stock, £4 14s. 6d.; on the Wimbledon stock, £4 12s. 6d.; on the Epsom stock, £5 5s.; and on the new ordinary stock, £4 14s. 6d.—all less income-tax.

Re-election of Directors and Auditor.

The Deputy-Chairman moved the re-election of the Chairman as a Director, and, in doing so, remarked upon the value of his expert knowledge to the undertaking.

Mr. H. S. Freeman seconded the motion, which was very heartily agreed to.

The Chairman next moved the re-election of Messrs. T. A. Ives Howell and G. F. Page, and spoke of their invaluable services to the Company.

The Deputy-Chairman seconded the motion, which was unanimously adopted.

Mr. E. L. Burton was re-appointed one of the Auditors, on the motion of Mr. J. C. Potter, seconded by Mr. Webb.

Votes of Thanks.

On the proposition of Mr. Webb, seconded by Mr. Samson, a cordial vote of thanks was passed to the Chairman and Directors for their services in these anxious times.

The Chairman, on behalf of himself and colleagues, thanked the proprietors for this proof of their satisfaction, which was all the more agreeable to the Board in view of the fact that they were not before the proprietors with increased, but with diminished, dividends. The diminution of dividend might well have been more had it not been for the indefatigable services of Mr. Braine and Mr. Carr, their staffs, and the workmen and women generally, as well as—he specially wished to mark them—the captains and crews of their vessels. As the proprietors knew, their captains and sailors faced great hardships and dangers. But in every capacity the Company had an admirable staff; and those in the ranks were not the least worthy of recognition. To the war they had sent a considerable number of men—some 670. They had just heard of the loss of an amiable and promising young man who was formerly in Mr. Braine's office. This was Lieut. Alfred Fudge, R.F.C. He was an accomplished officer, and was killed while flying in France. It was intended to have a Roll of Honour at their works, enshrining the services of these brave young fellows they had lost. He moved a hearty vote of thanks to the chief officers, staffs, and men both on land and sea.

Mr. Maitland seconded the motion, which was heartily agreed to.

Mr. Braine, in thanking the Chairman and proprietors on behalf of his staff and himself, said such recognition of their services was greatly appreciated. They strived to do their duty. With regard to the loss of Mr. Fudge, who was one of his assistants, he was a most promising fellow-worker; and he (Mr. Braine) felt he had lost a friend whom he appreciated very much.

Mr. H. O. Carr said, on behalf of himself, his staff, captains, sailors, workmen, and workwomen, he thanked the Chairman for his kind remarks, and the proprietors for their endorsement. The men all eagerly read the remarks made regarding their services at the half-yearly meetings; and they highly appreciated them. He could assure the proprietors that, from top to bottom, the employees of the Company had its best interests at heart.

BATH GAS COMPANY.

A Centenary Meeting.

The meeting of shareholders in the Bath Gas Company which was held last Wednesday was of a very special character, as it is a hundred years ago since the undertaking was started.

The Deputy-Chairman (Sir Percy Stothert, K.P.E.) presided in the absence through illness of the Chairman of the Company, Mr. Albert Browning. Sir Percy said it was just a hundred years since the Company was established, and he only wished they could have witnessed the anniversary in peace and quiet, instead of in the midst of a strenuous war. Had it fallen in the days of peace, they would probably have had a visit from the principal Gas Association to their works. But this was, of course, out of the question now; and the anniversary would be a much smaller affair than otherwise. He did not propose to go into the Company's history at any length, because their late Engineer and Manager, and now their Consulting Engineer (Mr. C. Stafford Ellery) had been at work for the past two years upon a highly interesting booklet which would be circulated among the stockholders. It had involved a vast amount of work, in the course of which Mr. Ellery had read through the whole of the minute books since the Company was started. But to Mr. Ellery it had been a labour of love; and it was a service the Board greatly appreciated. One or two facts of the Company's history could be alluded to. When the Company was founded, the capital was only £40,000; and in 1820 the gas-rental was but £3800. To-day their capital was roughly £360,000; and the gas-rental last year £84,773. So that they would see the Company had grown and prosperously grown. That day was also interesting to him personally, because he was celebrating his Jubilee as a Director. When he came on the Board twenty-five years ago the output of gas was about 400 million c.ft.; last year it was over 900 millions, or considerably more than double. Now his long experience of gas companies was that the bulk of people looked upon such companies as footballs which they liked to kick when a little out of temper or whenever possessed of a little excess energy. Since the war he thought they had had more kicks than ever. People complained of the want of illumination, that the gas was a bad quality, &c. Well, they were compelled by the Ministry of Munitions to extract certain products; but with the modern incandescent burner it did not make the slightest difference how much benzol or toluol was extracted. Therefore, people who made complaints about the illuminating power to a large extent had only themselves to blame for not keeping up with the times. Then, again, they got kicks about pressure and other things. But at the same time the Government had been advertising very largely that gas should be used in every possible contingency; and the result had been an enormously increased consumption in Bath during the winter. So much so that their resources had been taxed to the very utmost, and the life of their Engineer and Manager (Mr. J. Wesley Whimster) had been anything but a pleasant one. In other ways they had been hampered considerably by Government interference. One was by the maximum price fixed for sulphate of ammonia, which, compared with nitrate, was much too low; and the balance-sheet suffered in consequence. Next was the interference with the price of coal. Not only did they have to pay a much higher rate for coal, but it was of a much inferior quality. On the subject of coke, the Chairman said the most wasteful way of using coal was in an open grate. Government committees were at work; and he hoped (though he might not see it) that the country would cease wasting its capital and use only gas-fires and other means. Coke was almost half the price of coal; yet its heating value was within a few per cent. of that of coal. As to the price of gas, Sir Percy remarked that owing to the conservative and extremely safe policy which had been adopted by the Company—*i.e.*, keeping the capital within extremely moderate dimensions compared with the volume of business—they had been able to supply gas in Bath at a much cheaper rate than their neighbours and other companies. Bath, in fact, stood certainly among the first five towns in the kingdom where the lower prices obtained. Their present price, advanced by 3d. in January, because of the increasing price of coal and labour, was now only 2s. 3d. per 1000 c.ft., compared with sums verging on 4s. in some of the London companies. Coming to the past year, he moved the adoption of the report and mentioned that the £6000 set aside for essential renewals and repairs would be invested during the "Bath Business Men's War Bond Week" towards the city's destroyer. Expenditure of coal had increased by £16,000, not entirely due to the price, but also to the extra amount used. The Company had made a great concession to the penny in the slot consumers by fitting incandescent burners free. Private consumers' payments showed an increase of £13,500, due to the soldiers' war hospitals, greater use in munition factories, &c. This had all taxed the plant almost to its limit. Public lighting had dropped to practically a negligible factor. It was, however, extremely satisfactory that they were able to carry forward a balance to the profit and loss account of £23,889, as compared with £18,385; and great credit was due to the staff—especially the Engineer and Manager.

The report was adopted and a 5 p.ct. dividend for the past half year was declared; the retiring Directors and Auditor were re-elected; and a cordial vote of thanks was passed to Sir Percy and the Directors generally.

A hearty vote of thanks was also accorded the staff; and Mr. H. Shepherd, the Secretary, replying, said he had served the Company for forty-three years and his predecessor (Mr. George Helps) for forty-eight years. Mr. Whimster also spoke in acknowledgment.

A further vote was passed to Mr. Ellery, who, returning thanks, said that in the whole hundred years the Directors had met at least weekly, and had without exception recommended a dividend every year. The Company was never in a stronger position than to-day.

BARNET DISTRICT GAS AND WATER COMPANY.

A Large Increase in Gas Consumption.

The Half-Yearly General Meeting of the Company was held last Wednesday, at the London Offices, No. 139, Cannon Street, E.C.—Mr. ARTHUR F. PHILLIPS in the chair.

The SECRETARY (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the anxiety which in the previous year occupied the minds of the Directors, to efficiently maintain the supply of gas and water to the considerable area over which the Company were responsible, had not, he could assure the proprietors, diminished. To obtain a satisfactory supply of coal, to meet the ever-increasing demands of labour, and to find men to replace those called for military service had required the closest attention of the staff and the Board. So far they had been successful; but it was impossible to forecast what the future had in store for them. Considering the difficulties contended with, the results of the half year were highly satisfactory. The sale of gas showed an increase of nearly 14½ p.ct. over the corresponding half year; but the water-rental, which was the more important of the two undertakings, because the Company's water area was much larger than the gas area, was slightly under 2½ p.ct. increase. The reason for this slight increase over an area which included districts like Finchley was that there had been no new buildings erected, and the water supplied for trade purposes had been less. One satisfactory feature in the accounts was that neither in the gas nor the water undertaking had there been any addition to the capital. Revenue had borne all charges, with the exception of those in respect of the benzol-recovery plant (£282) and the hot-coke conveyor (£405), which had been debited to the contingency fund. This was satisfactory, because new consumers were not being sought in either the gas or water business. The increased consumption of gas was due to consumers making more use of their cooking and heating stoves, in consequence of the increased cost of coal and the difficulty in obtaining it. The gas revenue account showed that coal and oil cost £11,830, against £9196 in the corresponding half year. Wages went up from £995 to £1191; repairs and renewals of meters, from £292 to £480; and the war bonus, from £522 to £885. The receipts for gas increased from £16,299 to £18,544; and for products, from £4704 to £6062. The net result of the half year was a reduction in the profit from £4010 to £2822. There having been a further advance of 2s. 6d. per ton in the price of coal, and additional increases in the wages having had to be conceded, the Directors had no alternative but to increase the price of gas by 4d. per 1000 c.ft., to take effect from the reading of the meters at Christmas last, and now making the price 3s. 8d. per 1000 c.ft. The expenditure on the water undertaking for coal and pumping charges was £3294, against £2861 in the corresponding half year; for maintenance £1678, against £1292; and war bonus £885, against £522. As the increased water-rental was only £589, the balance of profit fell from £14,326 to £13,275. The working of the undertaking had been satisfactory. Both the gas and water works and all the distribution plant had been well maintained. The sale of gas was 11,955 c.ft. per ton of coal carbonized; and the coke for sale was 10¾ cwt. Taking all the pumping-stations, and the various conditions under which they were worked, the average consumption of fuel was 3·75 tons per million gallons of water pumped—the lift varying from 373 to 557 feet. The profit and loss showed that—after adding the £23,866 brought forward to the profit from the gas and water undertakings for the previous half year, and deducting £3868 for income-tax (which was reduced by a credit for excess profit), interest on debentures £1479, and interest on temporary loans £18—there remained a balance of £34,854, from which the dividends of £9, £8, and £6 6s. p.ct. were recommended—leaving £23,729 to carry forward to next year's account. The Company were continuing to comply with the Government requirements in the extraction of benzol for the production of explosives. The Company were well served by its staff and the employees. The Directors realized that the cost of living had increased; and they considered they had been liberal in the increase of wages to meet it. But there had been a disposition of late to make demands which appeared unreasonable, and not justified. The Company paid last half year £1790 in war bonus. Since the last meeting, the Board had to regret the loss of a valued member by the death of Mr. Alfred Lass. He was not quite the first Secretary, as the Barnet District Gas and Water Company was formed in 1872, and Mr. Lass was not appointed Secretary till 1873—a position he held till 1898, when he retired, and was appointed a Director. During many of the concluding years of the last century, Mr. Lass occupied a leading position in gas matters as an accountant, and was engaged in most parliamentary contests and arbitrations relating to gas undertakings. For some years past, his health did not allow him to take any active part in work, but what he did in his day was held in high appreciation. To the vacancy created, the Board elected Mr. Alfred Wood—a gentleman with experience in the administration of gas and water undertakings, and a shareholder in the Company for some considerable time.

The DEPUTY-CHAIRMAN (Dr. J. W. L. Glaisher, F.R.S.) seconded the motion.

Mr. H. G. HILLS desired to join in the tribute of respect to the late Mr. Alfred Lass. He had the pleasure of his acquaintance for between thirty and forty years. He was a man of perfect integrity, and of the highest qualifications as an accountant for gas and water undertakings. His death was a great loss to any institution with which he was connected. He (Mr. Hills) suggested that the sympathy of the proprietors should be conveyed to Mr. Lass's family.

Mr. F. H. PILLEY asked to be allowed to support the suggestion made by Mr. Hills.

Mr. C. WEBB said the Chairman had stated that the amount of gas sold per ton of coal carbonized was 11,700 c.ft. He should like to know what it was in pre-war time. He understood that the coal now was of inferior quality.

The CHAIRMAN replied that it was; but the condition was not so very bad until about Christmas time. The make of gas per ton of coal last year averaged 13,380 c.ft., compared with 14,500 c.ft. in 1914.

Mr. ARTHUR VALON: Is the quality of the gas still being kept the same?

The CHAIRMAN replied that, as the proprietors were aware, the Company were now extracting benzol from the gas for Government requirements.

Mr. WEBB said it seemed to him that the Government were not showing any large amount of gratitude for the way the gas companies were serving them. They seemed to control everything the Company had to buy and had to sell; and altogether it was an unkind way of showing gratitude.

The CHAIRMAN said the Directors would convey to Mr. Lass's family the expression of the proprietors' appreciation of his services. With regard to the quality of the coal, he thought the Government were doing all they could. They could not control the men at the pits any more than the Directors could. He believed that if they could send the coal free from impurities, they would do so; but it was not within their power. As to the appreciation of the Government of what the gas companies were doing, they had expressed it very strongly; and Lord Moulton, the Director-General of Explosives Supplies, had stated that had it not been for the assistance rendered by gas undertakings in supplying material for the manufacture of explosives, the war could never have been carried on.

The motion was unanimously adopted.

The CHAIRMAN proposed the declaration of dividends for the half year (less income-tax) at the rates per annum of 9 p.ct. on the "A" and "C" stocks, 8 p.ct. on the "B" stock, and £6 6s. p.ct. on the "D" capital gas and water stocks.

Mr. SAMUEL CUTLER, sen., seconded the motion, which was adopted.

The DEPUTY-CHAIRMAN proposed the re-election of the retiring Directors (the Chairman and Mr. Alfred Wood). He remarked that it was a great relief to have at the head of the Board a gentleman of the wide knowledge that Mr. Phillips possessed of gas and water affairs; and they owed a great deal of the prosperity of the Company to this fact. Mr. Wood was their new Director; and he brought to their Board an experience which would be very valuable.

Mr. F. E. ELLIOTT seconded, and Mr. W. GRIFFIN supported, the proposition, which was very heartily passed.

On the motion of Mr. F. R. SMITH, seconded by Mr. ELLIOTT, Mr. B. Dennett Holroyd was appointed one of the Auditors.

The CHAIRMAN said he had next to ask the proprietors to pass a resolution expressing their appreciation of the services rendered last year by their Engineer (Mr. F. J. Bancroft), their Secretary (Mr. Drew), the staff, and all the employees of the Company. They had all acted thoroughly loyally, and had contributed to the satisfactory result of the past half year; and not only the men, but he was pleased to say the women as well who were now in the Company's employ, and who had taken the place of those men who had been called upon for military service. The position of an engineer of a gas and water company was in these times one of great anxiety. He had the difficulty of providing coal, oil, and the other materials required, as well as continually discussing labour questions, and obtaining the necessary men to carry on the works. Fortunately, Mr. Bancroft had handled these difficult matters very successfully. They had also received from Mr. Drew the assistance he always gave in controlling the accounts; and he had at all times been only too willing to give the best possible advice to the Board.

Mr. COLIN DOCWRA seconded the motion, which was cordially passed.

Both Mr. DREW and Mr. BANCROFT expressed their appreciation, on behalf of themselves, their staffs, and all workers, for the kindly recognition of their services.

Moved by Mr. HILLS, and seconded by Mr. WEBB, acknowledgment was also made of the services of the Chairman and Board.

Financial Burdens at Bishop's Stortford.—Compared with the corresponding period of the previous year, the sale of gas by the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company increased in the six months ended Dec. 31 by about 1½ million c.ft., or 2¾ p.ct., while the revenue from the sale of residuals was £553 more. In addition to the higher price of coal, the employees received important additions to the rates of wages and war bonus paid to them. These further financial burdens on the Company, the Directors intimate in their report, made it necessary to raise the price of gas as from Jan. 1 by 3d. per 1000 c.ft., which automatically reduces the dividends to £3 15s. 6d. p.ct. per annum on the "A" stock and £4 2s. 6d. p.ct. per annum on the "B" stock—both subject to income-tax. The dividends for the past half year are at the rate of £4 6s. p.ct. per annum on the "A" stock and £4 10s. p.ct. per annum on the "B" stock.

Ipswich Gas Light Company.—In the report which was presented at the annual meeting of the Company (of which the Rt. Hon. Sir D. Ford Goddard, M.P., is Chairman), the Directors stated that, after providing for fixed charges, there remained a profit balance of £7736. The amount brought forward from the previous year was £12,015, making a total sum of £19,751. There was an available balance of £15,332, out of which the Directors recommended the payment of a dividend at the statutory rates, which would absorb £4196, and leave a balance of £11,136 to be carried forward. Not only had the cost of coal and freight further advanced during the year, but great difficulties had been experienced in providing sufficient deliveries of coal to maintain the supply of gas; while the shortage of labour had been a serious problem to the management. The increased demand for gas, largely for munition purposes, had at times taxed the manufacturing and distributing power of the undertaking to its utmost capacity. The price was increased in March to 3s. per 1000 c.ft.; and in consequence of the continued rise in coal and freights and all material, together with increased wages and bonus to meet the extra cost of living, the Directors had been compelled to further raise the price to 3s. 4d. as from the December readings.

PROJECTED EXTENSIONS OF THE BIRMINGHAM GAS-WORKS.

Reporting to the Birmingham Corporation the Gas Committee say that the continually increasing demands upon the department for gas, chiefly for munition works, is putting a severe strain on the carbonizing plant at the various works. This has caused the Committee grave concern; and they have consequently again issued an appeal exhorting all classes of consumers to cut down their consumption to the lowest possible limit.

The increased output of gas from the end of September to Christmas averaged 33⅓ million c.ft. per week more than in the corresponding period of 1916; and during the week ended Jan. 12 this year the output reached 334,131,000 c.ft., which is the highest weekly output in the history of the department.

The new vertical retorts at the Windsor Street works are not yet completed; the work having been delayed owing to shortness of labour and materials.

An order has been placed for a water-gas plant to be erected at the Adderley Street works, capable of producing about 700,000 c.ft. per diem, at a cost of £3290. This plant should, it is said, be ready for work shortly.

The vertical retort plant at the Windsor Street works will, when completed, be capable of producing 2,750,000 c.ft. per day; but the heavy and growing demands make it imperative that the reconstruction of further carbonizing plant at this works shall be proceeded with without delay, to enable the department to cope with next winter's requirements. Negotiations are accordingly proceeding for the erection of three additional rows of Woodall-Duckham vertical retorts at Windsor Street, capable of producing 8¼ million c.ft. of gas per diem. This will take the place of some of the present horizontal retorts, which are now worn out. The installation of the plant will be commenced immediately the necessary consents are received from the Ministry of Munitions, to whom the urgency of the matter has been explained.

The industrial research laboratory has been fully justified, it is pointed out, by the large amount of investigation work done since its commencement; and it is satisfactory to note that the more the laboratory becomes known among manufacturers, the larger is the volume of work received. A great deal is being done in connection with munitions of war; but advice is also being sought by manufacturers as to after-the-war problems. Special work has also been undertaken for the Admiralty and the Air Board, who, together with other departments of the Government, are making increased use of the laboratory.

COMMITTEE ON PRODUCTION AWARDS.

Gas-Workers' Claims.

Awards have now been issued by the Committee on Production in connection with a number of gas-workers' wages claims that have come before them for decision.

Brighton and Hove Gas Company.

Application was made to the Company by the National Union of General Workers: (1) That the war bonus be raised to 15s. per week for all over eighteen, and 7s. 6d. to all under eighteen; (2) that the price of working coal be raised to 6d. per ton for steamboats and barges; (3) yard pay to be increased to 7d. per hour for day work and 7½d. for night work, such as odd men on nights; (4) double time for all Sunday work, and time-and-a-half for all overtime. The matter was referred to the Committee on Production. Representatives of the parties were heard, and the decision of the Committee was in the following terms: (1) Claims (2), (3), and (4) are not established. (2) That the graduated war bonus paid to men aged eighteen and over be abolished, and, in lieu thereof, they shall receive a war bonus of 15s. per week. (3) Boys and youths under eighteen shall receive a war bonus of 7s. 6d. per week, any war bonus hitherto paid to merge in the amount awarded.

Carlisle Corporation.

Application was made to the Carlisle Corporation by the National Union of General Workers for an advance of 10s. per week to the employees in the gas, electricity, and other departments. The matter was referred to the Committee on Production, who, having heard the parties, decided: (1) That the war wage advances on pre-war rates to men aged eighteen years and over shall be increased to 16s. per week, payable at the rate of 2s. 8d. per day or shift. (2) This advance is payable as from the first full pay in January, 1918.

Cheltenham Gas Light and Coke Company.

An application was made to the Cheltenham Gas Light and Coke Company by the Amalgamated Society of Gas, Municipal, and General Workers for war time advances to be made up to 20s. per week for men over 18 years of age. The matter was referred to the Committee on Production. Representatives of the parties were heard on Jan. 23. The decision of the Committee is as follows: (1) That the men concerned, aged 18 years and over, shall receive an advance of 5s. per week, on the same terms and conditions as the advances previously granted during the war period. (2) The amount hereby awarded is to be regarded as a war advance, and recognized as due to, and dependent upon, the abnormal conditions now prevailing in consequence of the war. (3) In accordance with an agreement between the parties, the advance is payable as from the beginning of the first full pay week in December, 1917.

Halifax Corporation.

Application was made to the Halifax Corporation by the Workers' Union on behalf of the Union's members in Corporation employ. The application was as follows: (1) That all male employees be granted such further increase in wages as will bring the total advance in wages received during the war period up to 20s. over and above their pre-war rates, with the addition of a bonus of 12½ p.ct. added; (2) that all female employees be granted an advance of 10s. per week on their present rates; (3) that an extra allowance of 2s. be made to horsemen for attendance to stable duties; (4) that in the event of any future advance in wages being conceded to the employees engaged in the engineering trade by the Committee on Production, such advance shall apply to the employees herein specified; (5) the foregoing application is intended to cover the employees under the following Committees: Gas, Water-Works, Baths, Parks, Markets, Health, Highway, Electricity, and Sewage (men and women). The application was not conceded; and the matter was then referred to the Committee on Production. Representatives of the parties were heard on Jan. 17. The finding of the Committee was in the following terms: (1) That as from the beginning of the first full pay in January, 1918, the advances already given to the men concerned, aged 18 and over, since the outbreak of war shall be so increased that the advances on the respective pre-war rates shall be 16s. per full ordinary week in the case of day workers, and 2s. 8d. per shift in the case of shift workers. (2) That in the case of the women employees in the Baths and Sewage Departments the advances already given since the outbreak of war shall be increased by 3s. 6d. per full ordinary week as from the same date. (3) This award shall not apply to those women in certified departments who are covered by orders of the Minister of Munitions under the Munitions of War Acts. (4) The amounts hereby awarded are to be taken into account in the calculation of payment for overtime, and are to be regarded as war advances intended to assist in meeting the increased cost of living, and are to be recognized as due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war. (5) That the claim for an extra allowance for horsemen has not been established. (6) The question whether future advances in the engineering trade shall apply automatically to the Corporation employees is one only to be dealt with by agreement.

Maryport Urban District Council.

The following finding is in respect of an application made to the Maryport Urban District Council by the National Union of General Workers on behalf of the gas workers and the other employees of the Council for an increase in wages of 20s. per week over pre-war rates. No settlement having been arrived at, the matter was referred to the Committee on Production for decision. Representatives of the parties were heard on Jan. 3. The Committee found: (1) That as from the beginning of the first full pay in January the advances on pre-war rates to the men concerned, aged 18 years and over, shall be increased to 16s. per week, payable at the rate of 2s. 8d. per day or per shift for each day or shift worked. (2) The amounts hereby awarded are to be taken into account in the calculation of payment for overtime and Sunday work, and are to be regarded as war advances due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war.

Perth Corporation.

Application was made to the Corporation of Perth by the National Union of General Workers, on behalf of their members employed in the gas-works, the street sweepers, the fire and lighting, and the works and paving departments of the Corporation, for an increase of wages of 8s. a week as from and including the 12th of December, 1917. As no settlement was arrived at, the application was referred to the Committee on Production for decision. Representatives of the parties were heard at Glasgow on Jan. 29. The Committee found: (1) The following advances shall be paid to the workpeople concerned, as from the beginning of the first full pay following the date of this award: (i.) men, 7s. a week; (ii.) women, 4s. 6d. a week. (2) The case of those employees who are not, owing to their age, able-bodied shall receive the favourable consideration of the Corporation. (3) The advances hereby awarded are to be taken into account in the calculation of payment for overtime, or for night duty or for work on Sundays and holidays (where extra payments are made for such work); but they are not otherwise to affect existing rates of pay—they are to be regarded as war advances, and are recognized as being due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war.

Stafford Corporation Gas Department.

Application was made to the Stafford Corporation Gas Department by the workmen for a permanent increase in all rates of wages of 10s. per week for all men above 21 years of age, in addition to increases already given since 1914 and existing war bonus still to be given. The application was not acceded to, and the matter was referred to the Committee on Production for decision. Representatives of the parties were heard on Jan. 3. The Committee found: (1) That as from the beginning of the first full pay in January, 1918, the advances already given to the men concerned since the outbreak of the war shall be so increased that the advances to each of the workers on their respective pre-war rates shall be 16s. per full ordinary week in the case of day workers, and 2s. 8d. per shift in the case of shift workers. (2) The amounts hereby awarded are to be taken into account in the calculation of payment for overtime, and are to be regarded as war wage advances due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war.

Workington Corporation Gas Department.

Application was made to the Corporation of Workington by the National Union of General Workers, on behalf of their members employed in the Gas Department, as follows: (1) That an advance in wages of 5s. per week be granted; (2) that all existing bonuses be counted as wages in the payment for overtime and Sunday work; (3) that boiler men be granted an advance in wages of 1s. per shift; (4) that the sulphate plant men be put on eight-hour shifts. No settlement having been arrived at, the matter was referred to the Committee on Production for decision. Representatives of the parties were heard on Jan. 3. The finding of the Committee is in the following terms: (1) That as from the beginning of the first full pay in January the advances to each class of male workers concerned, aged 18 years and over, shall be increased to 16s. per week on their respective pre-war rates, payable at the rate of 2s. 8d. per day or per shift for each day or shift worked.

(2) All existing bonuses and the advances hereby awarded are to be taken into account in the calculation of payment for overtime and for Sunday work, and are to be regarded as war advances due to, and dependent on, the existence of the abnormal conditions now prevailing in consequence of the war. (3) That the claims of the Union under heads (3) and (4) have not been established.

OUR FUEL RESOURCES AND SOME POSSIBLE IMPROVEMENTS IN THEIR UTILIZATION.

By Prof. W. H. Watkinson, M.Eng. (Liverpool), M.Inst.C.E.

[Extracts from a Paper read before the Liverpool Engineering Society, Feb. 20.]

The total estimated world's coal reserves in 1913, within 6000 ft. of the surface, amounted to about 7·4 million million metric tons. Great Britain's share of this coal is only 2·6 p.ct. of the total. It is evident, therefore, that if coal continues to be, as it is now, by far the most important source of energy, both for power and for heating purposes, the principal industries of the world will, within a few hundred years, be located in some other country than our own.

In spite of our comparatively small coal reserves, we have not had the wisdom and foresight to foster the scientific study of fuel and its methods of utilization; and in this respect, as in so many others, we have allowed more enlightened nations to far outstrip us. The output of our coal mines has for many years been increasing at an average rate of 2 p.ct. of each previous year's output. The total output for 1913 amounted to 287,430,000 tons; and the value of this, assuming an average price of 10s. per ton, amounts to over £143,700,000. Of this total quantity of coal mined, 186·5 million tons was used in 1913 for home consumption. Table I., taken from the interim report of the Coal Conservation Sub-Committee of the Ministry of Reconstruction, shows the various ways in which this was used.

Subdivision of Home Consumption.

—	Estimates Based on *pro rata* Increase, except where more Definite Figures are Available. 1913.	
	Tons.	Value at 10s. per Ton. £
Railways	15,000,000	7,500,000
Coasting steamers (bunkers)	2,500,000	1,250,000
Factories	60,000,000	30,000,000
Mines	20,500,000	10,250,000
Iron and steel industries	31,000,000	15,500,000
Other metals and minerals	1,250,000	625,000
Brick-works, potteries, glass-works, and chemical-works	5,750,000	2,875,000
Gas-works	18,000,000	9,000,000
Domestic	35,000,000	17,500,000
Total	189,000,000	£94,500,000

It is impossible to determine how much of the coal used in factories and in other works was for heating, and how much was used for power purposes. The author thinks it safe to assume that the total power used in this country now amounts to at least 11 million horse-power; and it is certain that recent and prospective developments in this country will require, in the near future, a total of at least 20 million horse-power.

Of the 186·5 million tons of coal used per year in this country, it will be seen from the above table that 18 million tons are carbonized in retorts at gas-works; the main product in this case being the gas, while the coke, tar, and ammonia are the bye-products. The volume of gas obtained is about 13,000 c.ft. per ton of coal carbonized; and its calorific value is between 500 and 600 B.Th.U. per cubic foot. Some of the resulting coke is gasified in gas-producers, and the gas thus obtained is used for heating the retorts. The remaining coke is sold; and it is consumed in slow combustion stoves and in other ways. The efficiency of this carbonization process is at present about 55 p.ct. In some cases some of the residual coke, instead of being sold as coke, is gasified in water-gas producers; and this gas, after enrichment, is mixed with that obtained by the distillation of coal. While it may still be possible to effect important economies in connection with the above process, it is evident that very good and efficient use is made of the coal dealt with in gas-works.

In the making of metallurgical coke for blast-furnaces and other purposes, about an equal quantity—viz., 18 million tons—of coal are dealt with per annum; and until comparatively recently in this country coke was the sole product obtained in this case. During recent years, however, about 8000 coke-ovens have been erected; and these, equipped with bye-products recovery plant, enable about 10,000 c.ft. of gas to be obtained per ton of coal carbonized, also considerable quantities of tar and ammonia. The calorific value of this gas is about 460 B.Th.U. per cubic foot. A portion of the gas is used for heating the ovens, and the residue is employed, in the best cases, either for power or for lighting purposes. In some cases the residual gas is sold to the local authorities, who mix it with the retort gas sold to their customers. The calorific value of coke-oven gas is higher than is necessary for the gas used in heating the ovens; and it would probably pay better to use producer gas for this purpose. The coal dealt with in coke-ovens is now being utilized as efficiently as that dealt with in the making of town's gas; and when all the metallurgical coke is made in coke-ovens, this branch of the coal utilizing industry will be on a satisfactory footing. At present, however, only about two-thirds of this coke is made by product recovery ovens; the remaining one-third being still made in bee-hive ovens.

In the iron and steel making industries the fuel is also used in a relatively very economical manner. Where coal is employed in the blast-furnaces, as in Scotland, the tar and ammonia are recovered from the blast-furnace gas; and whether coal or coke is used, the blast-furnace gas is used for (in addition to heating the blast) power purposes, either by means of gas-engines or steam plant. The volume of this gas per ton of iron made is about 152,500 c.ft.; and after deducting one-half of this for heating the blast, &c., the volume available is about 76,200 c.ft. per ton of iron made. Its calorific value is about 113 B.Th.U. per cubic foot; and the calorific value of the total quantity of available gas is about 32 p.ct. of the calorific value of the fuel fed into the blast-furnace. Gas-engines will now give a brake horse-power-hour for 10,000 B.Th.U. of heat in the gas supplied to them; so that the amount of power obtainable per ton of iron made per hour on this basis would be 990 B.H.P., and the power obtainable continuously from the gas given out by a blast-furnace making 600 tons of pig-iron per week would be about 4000 B.H.P. The results actually obtained at present, in the case dealt with, is about 3000 B.H.P.; but it is probable that in the near future much better results than have been given above will be possible. The power obtainable from blast-furnaces is much greater than that needed in iron-works. This surplus power may be transmitted electrically to adjacent steel-works, or it may be delivered into electrical trunk mains for general purposes.

It has been proved that when coke-ovens, blast-furnaces, and steel-works are combined, it is possible to make the finished steel without any coal beyond that fed into the coke-ovens. The coke-oven gas and the blast-furnace gas together suffice for all the heating required after the pig-iron leaves the blast-furnace, also for the generation of all the power required in the works. The same results could be obtained if the coal was coked near the colliery, and the coke and the gas sent to the combined iron and steel works, as none of the sensible heat of either the coke or the gas is utilized. The advantages of doing this would be that the iron-works would be relieved of the coking and chemical parts of the work; and these would be more economically carried out on the larger scale near the collieries. The reduction in the cost of transporting the reduced weight of solid fuel (coke instead of coal) would partly or completely compensate for the cost of piping the coke-oven gas to the steel-works.

The carbonization of coal in retorts, the making of coke in ovens, and the manufacture of steel by the open-hearth process, all owe their comparatively high efficiencies to the use of gaseous fuel and to the adoption of regenerators for pre-heating the gases before combustion, by means of heat abstracted from the products of combustion. It seems to be unlikely that much improvement in the thermo-chemical efficiency of the blast-furnace can be effected, because, owing to the oxidizing action of carbon dioxide on metallic iron at high temperatures, there must always be a large proportion of carbon monoxide in the gases that leave the furnace. The direction in which increased economy in the making of iron may be effected is in the more efficient utilization of the gaseous product of the blast-furnace.

In general, more than 99 p.ct. of the energy required in a house is needed for the warming of the house, for providing hot water, and for cooking purposes; and less than 1 p.ct. is required for lighting. For heating purposes in houses coal, gas, or electricity may be used; and it is interesting to compare the cost of each of these per unit of heat generated. In doing this the author will assume the following as approximate pre-war prices: Coal at £1 per ton, with a calorific value of 13,500 B.Th.U. per pound weight; gas at 2s. 1d. per 1000 c.ft., with a calorific value of 600 B.Th.U. per cubic foot; electrical energy at 1d. per B.T.U. From these data we obtain the following results: The cost of gas is 5·13 times, and the cost of electricity is about 36 times, the cost of coal per unit of heat; while the cost of electrical energy is 7 times the cost of gas per unit of heat. These figures taken alone seem to show that, for domestic heating, gas is an expensive luxury, and that electricity is too costly for all but the very wealthy classes. Other factors, however, enter into the problem. The author does not know of any results of reliable tests of the heating efficiency of a coal-fire, but thinks that it will not exceed, on the average, 25 p.ct. The efficiency of the latest types of gas-fires is about 50 p.ct., and the efficiency of an electric radiator must be in the neighbourhood of 100 p.ct. For warming a house, the central heating system, with coke or anthracite as fuel, is much the most economical; and the initial cost of the apparatus is so low that the outlay is repaid by the reduction of the fuel costs within four or five years.

For cooking purposes, both gas and electricity are admirably adapted; but the electric cooker is handicapped by the fact that the cost per unit of heat supplied is seven times that for gas—assuming that the efficiency of the oven is the same in both cases. The electric oven is said to effect roasting and other processes much better than the gas-oven; and the saving thus obtained, together with its better hygienic conditions, may neutralize the great difference in the energy costs of the two systems.

For power in this country, about as much coal is used as for all other purposes put together; and as most of this coal is employed in an efficient manner, it is in this connection that the greatest saving may be effected. It is possible at normal full-load to get a shaft horse-power-hour for slightly less than 1 lb. of coal when gas-engines and gas producers are used, even in small units; and it is possible to do nearly as well with steam-turbine plants when the units are very large —say, 20,000 H.P. and upwards.

As it is possible with quite small gas plants to obtain power with as small a consumption of fuel as in the largest steam-turbine plants, it would appear at first sight that there can be little advantage in having large generating units, and that the small manufacturer (for example), if he has a modern gas-power plant, has nothing to gain by taking energy from a large supply company. This view is defective, however, in that it omits to take account of several important factors. The most important immediate advantage of a large power generating station for supplying power over a wide area, as compared with isolated plants, is that the diversity of the demands for power tend to average out the demand on the power station; and a much better load factor is thus obtained. Another advantage may also be obtained by

the recovery of tar and ammonia from the fuel before it is burned in the boilers. This is not economically done in small isolated plants.

The electrical method of distributing energy is, in general, and with few exceptions, the most efficient and convenient; and the electric motor is the simplest, cheapest, and most convenient type of motor to use in most works. It is, therefore, on the development of great electricity generating stations that we must depend for the solution of the problem of the economical use of our fuel resources for power purposes. It might not be prudent to have the whole of the electricity supply of the country under one authority, unless the one authority was the State; but it would certainly be advantageous to have the number of authorities greatly reduced.

For most purposes on land the reciprocating steam-engine is practically obsolete, except for locomotive work; and the struggle at present is limited to that between the steam-turbine, the gas-engine, and the oil-engine. The steam-turbine, the gas-engine, and the oil-engine, each has its own sphere of usefulness. For very large units of power, especially where high rotative speeds are suitable, the steam-turbine is at present supreme; but where economical working with oil as fuel is of importance, the oil-engine is the most promising prime mover, because, even in plants of a few hundred horse-power, it consumes only a little more than half the quantity of oil that would be necessary for a steam-turbine plant of the highest power.

Prof. Watkinson thinks that the Coal Conservation Sub-Committee are wise in not recommending that the power stations should be erected at or near the collieries, but all the coal required for the super-power stations should be gasified at or near the pits, and the appropriate portion of this gas, generated at super-gas works, should be piped to the super-power stations. Coke-ovens are at present usually located near the collieries; and it needs only an increase in the number of these, or the installation of vertical retorts, to enable all the coal to be carbonized in the neighbourhood of the pits. The resulting coke, apart from the metallurgical coke, should then be gasified in gas-producers. This producer gas is the gas which should be supplied to the power stations; while the rich distillation gas should be sent through other trunk-main pipes, under considerable pressure, to pressure-reducing sub-stations in or adjacent to towns, from which it would be distributed at the usual pressure through the existing town mains. This scheme contemplates the abolition of the present town gas-works, and the substitution of a supply of gas "in bulk" to the existing gas authorities. Some such scheme would be as advantageous in connection with the supply of gas for domestic and other heating purposes as the proposed super-power stations would be in connection with power purposes. The advantages of the scheme just suggested are that it would enable valuable bye-products to be obtained from all the coal required for power purposes as effectively as these bye-products are at present recovered in gas-works; and as compared with the isolated gas-works at present in existence, it would have the great advantage that these products would be recovered on a very large scale instead of in the retail way in which they are recovered in nearly every town and village. This method would also enable small, poor, and other coal, which is now regarded as refuse in the collieries, to be dealt with in the most efficient manner. The additional coal thus rendered available would amount to about 65 million tons per annum. Calculations based on data already available show that energy can be transmitted through a gas-main over a distance of 100 miles with a loss of less than 10 p.ct. of the energy transmitted.

In Staffordshire, Mond gas, with a calorific value of 150 B.Th.U. (higher value), is distributed over an area of 123 square miles at a cost of 0·12d. per 1000 c.ft. The cost of distributing a volume of this gas having a calorific value equal to that of a ton of coal is slightly under 2s. It is certain that the cost of distributing a ton of coal by the truck and cart method to any point within this area of 123 square miles would, on the average, greatly exceed this.

The proposal to gasify coal, when the object of the fuel is to generate steam in a boiler, would have been absurd a few years ago, owing to the low efficiency which had been found to accompany the use of gaseous fuel in boilers. Long experience in the use of blast-furnace gas in boilers had shown that the thermal efficiency was only in the neighbourhood of 45 p.ct.; and it was often lower than this. Recent improvements in the arrangements for burning gas in boilers have, however, increased the efficiency to between 70 and 80 p.ct.; and with the Bonecourt system of burning gas in boilers the efficiency is over 90 p.ct. The above scheme would relieve the power station engineer of the difficulties incidental to the removal of ashes; and the power station would be freer from the dust and dirt which are so detrimental to machinery.

By the adoption of the super-power plant scheme and the super-gas works scheme, it would probably be possible to obtain from the tar bye-product all the oil fuel required for the propulsion of all the ships of our mercantile marine, assuming that the oil is used as efficiently as it is in Diesel engines.

Newmarket Gas Company.—The net balance of profit earned by the Company during the year 1917 was £2940; and out of the sum of £5726 standing at the credit of the profit and loss account, the Directors recommended the payment of a dividend at the rate of 6½ p.ct. for the year upon the original consolidated stock (less income-tax), leaving £2913 to be carried forward.

Uxbridge Gas Company.—The accounts for the year 1917, which were adopted at the recent meeting of the Company, showed a net profit of £11,602, and, adding the sum brought forward, a total available amount of £12,295, out of which the Directors recommended the payment of the statutory dividend in accordance with the increase in the price of gas, making an average for the year of £5 6s. 3d. on the consolidated stock (less income-tax), and leaving £650 to carry forward. The Chairman (Mr. H. E. Jones) said the cost of coals had gone up from 25s. 6d. to 37s. 11¾d.; and wages also had greatly increased. Then there was the serious question of the cost of transport under present abnormal conditions. On the other side, there had been an increase of nearly 20 p.ct. in gas consumption; and residuals had sold rather better. On the whole, the result of the year was extremely satisfactory.

CAPTAIN HILTON AND THE BIRMINGHAM GAS DEPARTMENT.

The Birmingham Corporation Gas Committee have reported to the City Council in regard to the letter recently received from Captain R. S. Hilton resigning his position as Secretary and Manager of the Gas Department.

They say: "It will be remembered that, with the approval of the Council, Captain Hilton joined the 1st Birmingham Battalion of the Royal Warwickshire Regiment on its formation, but was subsequently transferred to the Ministry of Munitions to assist Lord Moulton in connection with the production of high explosives. Although very busily engaged on this work, and also in connection with the work of the Local Munitions Committee in the management of the National Shell Factory in Birmingham, he has given ungrudgingly a large amount of time to the work of the Gas Department, particularly in connection with the purchase of coal and oil. During his seven-and-a-half years' service the growth of the undertaking has been enormous; and there is no doubt that this progress has been due, to a considerable extent, to the ability and initiative which have been displayed by him in all his duties; and his departure will be a serious loss to the Corporation. His personal keenness, and the tact and courtesy which have characterized the whole of his dealings with the workpeople and staff, have developed an *esprit de corps* and a state of efficiency which have been of the utmost value to the department and the consumers; and the Committee have placed on record their high appreciation of his services."

FINANCIAL HARDSHIPS.

Local Authorities and Opposition to Bills.

The Town Clerk of Islington, in a report to the Borough Council, stated that he attended a meeting of the Association of Local Authorities not Owning Gas Undertakings, and he ascertained that it was not unlikely that Parliament would appoint a Committee—probably a Joint Committee of both Houses—to consider the principle involved in the several gas companies' Bills. If this course were adopted, the Association, representing as it did so many of the local authorities not owning gas undertakings, would have an opportunity of appearing before the Committee by Counsel on the principle of whether or not the company should be empowered to raise the price of gas. It was proposed that the authorities represented on the Association should be asked to agree to contribute, on the basis of rateable value, to the expenses which will be incurred. The Town Clerk further pointed out that the effect of the substantial increase in the price of gas since the commencement of the war had very seriously added to the burden of consumers; that the price charged by the Gas Light and Coke Company for the period ended Dec. 31 last was at the rate of 3s. 4d. per 1000 c.ft. (and he understood that the present charge was to be further increased); that the additional burden of cost had been borne to the extent of six-sevenths by gas consumers, and the other one-seventh by the shareholders; and that the proposal contained in the Bill of the Company would have the effect, in a period of admitted adversity, of necessitating 80 p.ct. of the one-seventh which now fell upon the shareholders of the Company, falling upon the already heavily burdened gas consumers.

The Lighting Committee stated that they were of opinion that the stronger and more representative the combination of local authorities in opposition to the principle which is common to the Bills of the several gas companies, the more effective it was likely to be. In the circumstances, they thought that the Council should join the Association of Local Authorities not Owning Gas Undertakings in its efforts to oppose these Bills. Inasmuch, however, as the rateable value of the borough of Islington was much larger than that of the other authorities who proposed to be represented upon the Association, they did not think the Council should contribute on the basis of rateable value to the expenses that the Association would incur, but that each authority should pay an equal part according to the number of authorities represented; and further that, with a view to joint action being taken in opposition to the provisions of the Gas Light and Coke Company's Bill, a conference of authorities affected thereby should be convened by the Council at an early date.

GAS FOR MOTOR VEHICLES.

At Southend-on-Sea, Mr. C. S. Shapley (the Gas Company's Engineer and Manager) has adapted a standard Ford delivery van for using coal gas instead of petrol. The bag was made by Messrs. C. Spencer & Sons, of materials supplied by the Victoria Rubber Company. The van has been running for the last four months, and averaging 40 to 50 miles a day; and it has not given the slightest trouble. In fact, Mr. Shapley's own experience is that, with the special mixing chamber, it runs very much better on gas than on petrol. The tray containing the bag is very light; and, moreover, the bag does not flop over the side when partially deflated, on account of the fact that he has fixed elastic strainers right over the bag, which pull it into position. As regards the running cost, the bag is filled four times for a journey of 45 miles; and as it contains 125 c.ft. of gas, this works out well under 1d. per mile.

Recently the County Councils Association appointed a Sub-Committee to consider the question as to the supply of gas to vehicles from the points of view of temporary supplies during the war and permanent supplies after the war. At the meeting of the Executive Council held on the 20th ult. at Westminster, the Sub-Committee

brought forward the following recommendations regarding temporary supplies:

(1) That the protection afforded to highway authorities by the existing statutory provisions in regard to the breaking-up and reinstatement of highways should apply in the case of temporary supplies of gas to vehicles during the war.

(2) That all highway authorities should receive at least twenty-eight days' notice before any work is undertaken, and should be consulted as to the designs and positions of any stand-pipes, pillar-pipes, and supply and charging stations proposed to be erected on any road, street, or public place, as to the line of any proposed temporary cable, main, or supply pipe, and as to the proposed method of supply and storage, and that each authority in its discretion should be entitled to make objections thereto and also proposals to minimize inconvenience and obstruction to the public.

(3) In the event of any disagreement arising in this connection, the Local Government Board should appoint an inspector to decide between the parties.

(4) That all stand-pipes, pillar-pipes, and supply and charging stations erected for supply purposes should have proper protection and supervision.

(5) That the heights of the gas containers (where cylinders are not used) should be restricted.

(6) That if at any time after any pillar-pipe, stand-pipe, or supply or charging station has been erected, or any cable, main, or pipe has been laid along any portion of a road the highway authority interested should, after due notice, carry out any widening, lowering, or diversion along such portion of the road, the authority shall not be liable for any expense attaching to any consequential alteration, removal, or relaying of any such pillar-pipe, pillar-post, supply or charging station, cable, main, or pipe, and that any expense incurred in this connection shall be borne by the company, undertaking, or person owning any such pillar-pipe, pillar-post, supply or charging station, cable, main, or pipe.

(7) That all stand-pipes, pillar-pipes, and supply and charging stations shall, if the highway authority so requires, be removed, and full reinstatement made within twelve calendar months after the termination of the war, and at the expense of the undertakers.

Regarding supplies after the war, the Sub-Committee recommended: "That if, after the war, the permanent provision of gas and other supplies to vehicles is contemplated, the Association ask that they be afforded adequate opportunity of making representations and being heard upon the subject.

All the recommendations were adopted.

INCREASED DEMAND FOR GAS IN NEW YORK.

The New York Consolidated and the Brooklyn Union Gas Companies have accomplished what would apparently be an almost impossible task, even in normal times, by maintaining a full supply of gas throughout the Christmas season, although the demand during the last week of December was about 50 p.ct. advance on that of the corresponding period in the previous year. An editorial article in the "American Gas Engineering Journal," to which we are indebted for the following details, ascribes the cause to "a combination of coal shortage with several days of the lowest temperatures ever recorded" in New York.

The onerous nature of the stress thrown upon the resources of gas companies is evident from the fact that whereas the average daily consumption for Dec. 30 and 31, 1916, and Jan. 1 last year was 96,000,000 c.ft., the corresponding figures for the last three days of 1917 were 142,622,300 c.ft. This represents Manhattan and the Bronx alone. If Westchester and a portion of Queen's is added, a figure of 155 millions would be attained. The Brooklyn Union Company averaged a daily output, for the week ended Dec. 16, of 70 million cubic feet, and for that ended Jan. 1 this year 72 millions, which shows an average advance of 33 p.ct., though over some days on end the increase was 60 p.ct. This Company do not make coal gas, and are dependent upon a supply of anthracite.

Our contemporary very reasonably enlarges on the fact that such results are not practicable without the highest order of foresight and organization in regard to supplies of coal and other material, and not only placing orders for extensions early, but appointing inspectors to visit the contractors' works and see that completion was facilitated in every way possible. In emphasizing some of the special troubles now incidental to all concerned in the supply of gas, it is pointed out that a collapse would be excusable under much lower strain; and the gas companies have proved that they are not out to make money alone, but for public service, and have provided the most striking and spectacular justification of private ownership that has been recorded in many decades. Both companies had laid in large stocks of gas fires and heaters during the past summer, and the sales of these appliances by the Consolidated Company had been as many as 1300 in one day; while general hardware dealers disposed of more gas-heating devices within a few days than they were accustomed to handle in a year.

The efficient service rendered under such trying conditions, which avoided a great public inconvenience and danger, is compared with the unsatisfactory nature of the transit traffic undertaken by the municipal authorities; and the explanation given is that Government systems, local and national, are based on putting a leash on the powers of any one man. Such a system would certainly have proved fatal to the effective handling of the recent gas situation.

Mr. C. R. Armitage (the Engineer) reported to the Lancaster Corporation Gas Committee that the gas-works had now reached the maximum capacity for production, and the time had arrived for extensions. Rough schemes were submitted; but a detailed report with estimates is to be presented to the next meeting.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 4.

In pitch the position is strong, and cargoes continue to be shipped. Over 50s. net per ton is easily obtainable; but makers are already well sold. Permits are reported to have been obtained for some tar materials for road purposes. It is understood that about 4s. 3d. net per gallon in bulk has been paid for solvent naphtha, *ex* makers' works. Other tar products are unchanged in value.

Inquiries still come in for sulphate of ammonia; but practically there are no surplus supplies at present.

Tar Products in the Provinces.

March 4.

The average values for gas-works products during the week are: Gas-works coal tar, 27s. 6d. to 31s. 6d. Pitch, East Coast 20s. to 25s. per ton; West Coast—Manchester 18s. 6d. to 19s. 6d., Liverpool 19s. 6d. to 20s. 6d., Clyde 19s. 6d. to 20s. 6d., nominal. Benzol 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 3s. 10d. to 4s. Heavy naphtha, North, 2s. 3d. to 2s. 6d. Creosote, in bulk, North 4d. to 4¼d. Heavy oils, in bulk, North 4¼d. to 4½d. Carbolic acid, 60 p.ct. East and West Coasts, 3s. 4d. naked. Naphthalene salts, 90s., bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

Manchester District Tar Prices.

The average price realized for tar in this district, based on the value of the products for the month of January, was 33s. 6d. per ton.

FROM A MARKET CORRESPONDENT.

Tar Products.

Markets remain quiet; but there is no falling off in the demand for those products specially required for war purposes. There is no material alteration in pitch conditions; and prices remain about the same. The high freight rates, together with the general difficulty of obtaining tonnage, are having a somewhat restrictive tendency on export business, which is much to be regretted, as makers were hoping for further improvement. Home business does not vary much, and stocks are still being added to in one or two districts. Business in fuel oils, prepared in accordance with the last order, is fair. Obviously the demand for fuel oils must render of little value the older specifications for tar for road purposes; and with the appointment of a Committee to deal with these matters, some official information as to the most suitable fractions may be forthcoming shortly. Naphthas remain steady and in fair demand at late rates. So far there is no news of any intention to fix prices for these products; and as long as prices remain at or near the present level, no further restrictions are thought likely. Naphthalenes remain good markets. Crudes are well purchased at the usual wide range of quotations. The questions of export licences and shipping facilities are hampering business in refined sorts; but the demand is still sufficient to keep prices steady. Cresylic acid remains a good market, and now makes up to 3s. 3d. per gallon, casks included. Creosote, carbolic acid, benzol, and toluol are rapidly absorbed on official account. The range of quotations is as follows:

Aniline Oil (pure): 1s. 4d. per lb.

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40% 1s. 3d. per lb.

Crude Tar: London 32s. 6d. to 35s., Midlands 27s. to 29s.; North 28s. to 30s. per ton, *ex* works.

Pitch: London 48s. to 50s. f.o.b.; East Coast, 22s. to 24s. f.o.b.; West Coast—Liverpool 22s.; Manchester 22s. to 23s. f.a.s.; Clyde 22s. to 24s.

Solvent Naphtha: Naked London 90-190% 3s. to 3s. 3d.; North 2s. 9d. to 3s. per gallon; 90-160% naked London 4s. 3d. to 4s. 6d.; North 4s. to 4s. 3d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6¼d. to 6½d.

Naphthalene: Refined £30 to £32 10s.; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4¼d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4¼d. per gallon); heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 2s. 9d. to 2s. 10d. per gallon; 97-99%, 3s. to 3s. 2d. per gallon, casks free, *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

In the United States, bye-product outputs have fallen off during the past few weeks on account of the coal difficulty; and no permanent improvement can be looked for until the end of this month. As regards toluol, the British thermal unit basis of gas production is being substituted for the present candle power basis at most of the municipal gas plants, in order to produce as much toluol from the residue as possible. Some of the companies objected to the change; but the Government brought out an order to this effect, and agreed to make a settlement with the companies later. This settlement will probably be on the lines of a sufficiently high price for the toluol to cover any loss on outlay.

Sulphate of Ammonia.

There is little fresh news regarding this product. Deliveries are much delayed, and it looks as though supplies for this season will fall short of the demand. This might be serious for the farmer, as there

is a general shortage of fertilizers. Everything possible is being done to stimulate output. New plants are being laid down, and additions to existing installations are being made; but the area of expansion cannot be very large at the moment, and then there is the difficulty of obtaining plants and materials. War requirements are making further inroads upon supplies, and are likely to increase.

In the United States, sulphate is no longer regarded as a fertilizer material.

Nottingham Gas Finance.—Several salient features in regard to the financial aspect of the Nottingham city gas undertaking are brought under notice in the report just issued. One of the Auditors, Mr. W. Gatty, points out that the income last year amounted to £402,092; the sales of gas producing £289,486, and the residuals £118,812. The expenditure amounted to £310,735; the gross profit being £105,357, or £20,530 less than was the case in the previous annual period.

Plymouth Gas Bill.—A meeting of shareholders of the Plymouth and Stonehouse Gas Company was held on Feb. 19, for the purpose of considering the provisions of the Bill the Company are promoting for the variation of the sliding-scale and standard price under which the Company work. In the absence of Sir Joseph Bellamy (the Chairman), who is seriously ill, Mr. T. G. Greek Wills presided. Mr. H. Wolferstan (Solicitor to the Company) explained the provisions of the Bill; pointing out that it sought to mitigate the hardships which have been imposed upon shareholders by the operation of the sliding-scale under the abnormal conditions created by the war. A resolution approving of the Bill was unanimously passed; and in another resolution sympathy was expressed with Sir Joseph Bellamy in his illness.

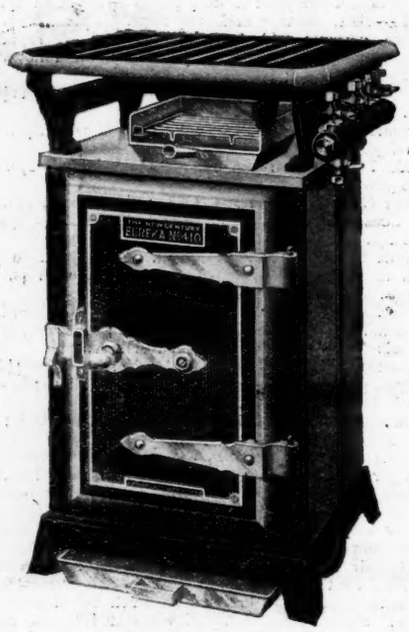
Leaving Work Without Notice.—At Ossett last week, the hearing was resumed in a case in which Joe Woodcock, now of Witham, near Hull, was summoned on a charge of having left the service of the Ossett Corporation Gas Department without giving notice. The summons was issued under section 4 of the Conspiracy and Protection of Property Act, 1875. Mr. A. E. Mottram and others in the department gave evidence that defendant had been a fireman in charge of the steam-boilers. When asked, on Dec. 21, why there was lack of steam in the retort-house, defendant used bad language and left work about 6 p.m., instead of the proper time of 8 o'clock. The man's service was subject to 14 days' notice. That evening there was very little gas in certain parts of the department's area, and practically none in some low-lying districts. Defendant did not come to work during the two following days, and sent a message on the third day, after promising to come, saying that he had fallen and hurt his head. The Manager replied, that he would not have the man back until the matter was settled in the Town Clerk's hands. Defendant then went to work at Hull. The Bench decided that the offence was a serious one; but as defendant had served his country as a soldier, there would be light penalty—a fine of £2, including costs.

Imported Coal Tax in Austria.

The "Board of Trade Journal" for last Thursday translated the following from the "Neue Freie Presse" (Vienna): The coal-tax proposed by the Austrian Government on Jan. 29 is modelled on the German coal tax, which came into force on Aug. 1, 1917, and amounts to 20 p.ct. of the contract price at the pit-head or, in the case of imported coal, at the frontier. There are some differences. Thus briquettes and coke produced from lignite in Austria are not taxed; the tax is imposed only on the value of the crude lignite. The explanation is that the production of lignite briquettes in Austria only amounts to some 2,000,000 metric hundredweight per annum; while in Germany most of the lignite is used in the form of briquettes. As in Germany, the tax is not payable on fuel used in the working of the mine, nor on that supplied to the employees of the mine. The latter quantity has been greatly reduced of late, as the general restrictions on the consumption of coal apply in this case. A provision not contained in the German law is that which gives exemption from, or reduction of, the tax on less valuable fuel used in the coalfield districts for the production of electrical power or gas. Provision will be made to avoid duplication of taxes on imported and exported coal between Austria and Germany. The net yield of the tax is estimated at 140 to 150 million kronen. The tax will be shifted from the coal-owner to the consumer, as has happened in Germany. It may hamper export when normal trading conditions are resumed; hence the tax is limited to two and a half years—*i.e.*, to the period ending July 31, 1920. With the present restricted consumption of household coal, the tax will not be a serious burden to householders, and a rebate of half the tax is allowed for small dwellings. The tax will, however, tell severely on industry.

Weston-super-Mare Gas Company.—The payment of the maximum dividend of 5 p.ct. on the ordinary stock (less income-tax) was recommended at the recent meeting of the Company, when the Directors reported that the sales of gas showed a decrease, compared with 1916, of 0·6 p.ct., which, having regard to present conditions, they considered to be satisfactory.

Chichester Gas Company.—The half-yearly meeting of this Company was held last Tuesday, with Mr. W. A. Walker in the chair. He made sympathetic reference to the recent death of Mr. Alfred Lass, who was Auditor from 1871 to 1890, and Chairman from 1890 to 1911. The total working charges (exclusive of coal) totalled £3224, compared with £2638 for the corresponding six months of 1916. Compared with the pre-war period, the results were startling indeed. In the cost of coal, after deducting residual products, there was an increase of nearly 66 p.ct.; the working expenses had been raised by nearly 6 p.ct.; while the revenue from the sale of gas had advanced only by 11 p.ct. Another formidable item was an increase of 54 p.ct. in income-tax. The sales of gas showed an increase of 2,609,200 c.ft., equivalent in money value to about £527.



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Plain Speaking on the Coal Question.

Dealing with the half year ended Dec. 31, the Directors of the Aberystwith Gas Company, over the signature of the Chairman (Mr. Henry Woodall), report as follows: The prosperity which has marked the career of our undertaking for so many years has received a severe reverse. Various circumstances, to which many other companies have been subject, have contributed to the weakening of our position; but most disastrous of all—and worse than all others combined—has been literally a stroke of the pen of the Coal Controller. This stroke of the pen severed us from our previous area of coal supply (Ruabon), and forced us upon South Wales, to receive therefrom such stuff as was available after all the normal requirements of that region had been met; and surely such rubbish as we received, in great part, never found its way into a gas-works before. For this rubbish, we have had to pay a much higher price than we had previously paid for high-class coal; much of the greater cost being due to the extra transport involved—the South Wales collieries being 30 miles further away than Ruabon. The embarrassments of the management entailed much correspondence, of course; but no tangible recognition of our most exceptional position is, so far, perceptible. At length, however, we have succeeded in finding a fairly good coal, which averts the absolute collapse at one time regarded as inevitable. The accounts exhibit the extra cost of coal for a period of three months only; so that the full sum of our misfortune will not be known until the close of the next half year. Meanwhile, the Directors have most reluctantly been constrained to raise the price of gas by 10d. per 1000 c.ft. The balance of profit amounts to £1082, out of which the Directors recommend the payment of dividends (less income-tax) at the rate of 10 p.ct. per annum on the original shares, 7 p.ct. per annum on the new shares, 5 p.ct. per annum on the preference shares, and 4½ p.ct. per annum on the debenture bonds.

Southend Gas Company.—At the annual meeting of the Company, the Chairman (Mr. J. H. Burrows) said that, in spite of the exodus of the inhabitants following an air-raid last August, the dividends recommended were the same as those for the corresponding period of last year, but less—though not much less—than those agreed to six months ago. The Directors were eminently satisfied with the result of the last six months' work. It had been the most troublesome period in the long history of the Company. A considerable sum had had to be taken from revenue to meet the cost of repairing a serious fracture of a main caused by an air-raid; and the Engineer (Mr. C. S. Shapley) and staff had a time of the gravest possible anxiety. However, they went into the work with enterprise, energy, and skill; and after about a fortnight the gas supply of Westcliff, which had been in danger, was assured. When the report had been adopted, dividends were declared at the rate of 5¼ p.ct. per annum on the original and new ordinary stocks, and at the rate of 4¾ p.ct. per annum on the new ordinary "B" stock (all less income-tax).

Aldershot District Gas and Electricity Supply.

Reporting on the half year ended Dec. 31 last, the Directors of the Aldershot Gas, Water, and District Lighting Company stated that the revenue account showed a surplus of £11,320. They recommended the full statutory dividends for the half year of 5⅜, 3¾, and 5 p.ct. per annum on the "A," "B," and "C" stocks respectively. The sales of gas (excluding works and special contracts) had advanced 18·1 p.ct. Moving the adoption of the report and accounts at the meeting, the Chairman (Mr. W. T. Robertson) pointed to the difficulties with which they had been beset, and stated that a very considerable increase in the price of gas was inevitable. At present the price in the Aldershot district was only 3s. 3d. per 1000 c.ft. They had grave difficulties still ahead of them; but they had a good captain, who knew how to steer the ship. It was to be hoped that during the next year the increases in the manufacture of gas were going to be as great as they had been in the past; and they felt certain the works were going to be so adapted that the total amount of gas should be turned out successfully, as it had been in the past. They were proud of the Company. When they looked round the country, and found the restrictions which other large companies had had to put upon their consumers, they were glad that throughout the whole district the Company served they had never had once to put a restriction upon any one consumer as to the amount of gas he could consume. During the last twenty-years, the increase in the consumption of gas in the district had been enormous; and if they took this as a basis of what the increase was to be for the next ten years, they expected to have to provide accommodation in their plant for the manufacture of 600 million c.ft. more gas than they were making to-day. They expected this would mean within ten years a capital expenditure of over £400,000. Hitherto Mr. R. W. Edwards had held the joint position of General Manager and Secretary; but he was now Managing-Director; and to the position of Secretary they had appointed Mr. W. Fish, who had been with the Company for some years. Two extraordinary meetings were subsequently held. At the first, a further issue of capital was authorized; and at the second, the proprietors approved of the Bill which is being promoted for the purpose of extending the Company's district for the supply of gas and electricity.

Wakefield Gas Company.—Presiding at the annual meeting, Mr. G. A. Moorhouse referred to the increasing cost of wages and of all materials used in manufacture, which was further accentuated by the last advance of 2s. 6d. per ton in the price of coal. These advances made it necessary to raise the price of gas 4d. per 1000 c.ft., which, under the sliding-scale, reduced the final dividend to 1½ p.ct., compared with 4 p.ct. before the war; and this meagre return was subject to income-tax, reducing it to 1⅛ p.ct. The gas industry deserved better treatment at the hands of the Government, seeing the great services they were rendering to the nation in the present crisis. The surplus carried forward was reduced by £874.

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Associated Tar Distillers.—A private Company has been registered, with a capital of £100 in £1 shares, to carry on the business of tar distillers, &c. It was stipulated that, in the event of the whole capital not being subscribed by Feb. 21, 1918, the Company was to be dissolved. The Solicitors are Messrs. Ashurst, Morris, Crisp, & Co.

Increased Sales at Ilfracombe.—The accounts presented at the annual meeting of the Ilfracombe Gas Company last week showed an available balance of £2226; and sanction was given to the payment of dividends of 2½ p.ct. on the preference and ordinary stock, making, with the interim payments, the full statutory dividends for the year. Mr. R. M. Rowe, who presided, referred sympathetically to the death of Mr. W. C. Rafarel, the late Chairman. He said the revenue account was the most satisfactory since 1913. There was an increase in the sales of gas for private lighting alone of nearly 2,000,000 c.ft., and the revenue from residuals showed an increase of £416 as compared with 1916. On the other hand, war bonuses to employees had increased by £121.

A Satisfactory Half Year at Sutton.—The Directors of the Sutton Gas Company reported for the past half year a balance on profit and loss account available for distribution of £6899, from which they recommended the payment of a dividend at the rate of 5 p.ct. per annum, less income-tax, for the six months. The Chairman (Mr. T. Charles) said he thought the proprietors would agree that, in all the circumstances, they had had a singularly prosperous half year. He had no hesitation in saying it was the extraordinary ability and the earnest sincerity of Mr. Stephen Carpenter (their Manager) that had been the main cause of this prosperity. The increase in gas sold, as compared with the corresponding half of the previous year, was about 17 p.ct.; and he felt he could congratulate the consumers on the fact that the Board had not had to raise the price of gas. Notwithstanding all their difficulties, they were still charging only 3s. 2d. per 1000 c.ft.

Sunderland Gas Company.—The report of the Sunderland Gas Company for the past year states that the receipts from the sale of gas were £95,707, compared with £88,054 in 1916, and from residual products £75,609, compared with £63,426; other items bringing the total income to £176,531, compared with £156,742. After meeting expenses, which total £160,120, against £137,598, there is a balance transferred to the net revenue account of £16,410, compared with £19,144. In September last, an interim dividend was paid; and the Directors recommend the declaration of a like dividend of 5 p.ct. on the original stock, and 4¾ p.ct. on the additional capital stock (less income-tax). The Directors record with regret the death of their colleague, Mr. Stansfield Richardson, who, as Director, and 12 years as Chairman, served the Company for 31 years. They have elected Mr. W. F. Vint as Chairman. The gas manufactured was the highest in the history of the Company—viz., 1,288,852,000 c.ft.—an increase over 1916 of 10·51 p.ct. The greatly increased cost of coals and all materials used has rendered it necessary to raise the price of gas 2d. per 1000 c.ft., commencing with the accounts due in March.

Meter-Rents Re-imposed at Wellingborough.—The quantity of gas sold by the Company during the last half of 1917 was nearly 6 p.ct. in excess of the corresponding period of the preceding year. The Directors, in their report, state that they have given careful consideration to the problem of meeting the great increases in the cost of coal and of working expenses, and the further increases which have still to be faced. They have found it necessary to re-impose the charges for meter-rent, which were discontinued about twenty years ago. Under the present scale, gas for power is in many cases supplied below cost; and the Board have therefore decided to increase the price (for power only) by 4d. per 1000 c.ft. from April 1.

Exeter Gas Company.—Yesterday week the annual meeting of the Company was held, with Mr. G. Hardy Harris in the chair. The Directors reported that the sale of gas showed an increase of 50 million c.ft. over 1916, or nearly 12½ p.ct. In order to partially meet the large increase in the cost of coal, materials, and labour, the price of gas was raised 2d. per 1000 c.ft. as from Christmas last—making the current general price 3s. per 1000 c.ft. The Board recommended dividends as follows: 10 p.ct. per annum on the £40,000 of original stock, and 7 p.ct. per annum on the £46,500 of new ordinary shares, less income-tax. The Chairman, in moving the adoption of the report, said it was generally considered that the conduct of a gas company was prosaic; but at present it was quite romantic, owing to their numerous difficulties, which included continual regulations issued by the Government. These, he considered, did not always show the best possible judgment. The regulations must be accepted, although people sometimes wondered why the men selected for the control of particular departments seemed to be those who obtained prominence or eminence in other positions in life. Owing to the advice of Mr. Westlake (their Manager) the Company had not felt any very serious shortage in the supply of coal; but they suffered very seriously indeed from irregularities in transport. Alluding to the quality of the coal, the Chairman said, instead of the Company being able to rely upon a suitable commodity always being sent them, they sometimes had to put up with practically anything they could get, with consequent considerable loss in manufacture. Referring to the question of wages, the Chairman said it seemed to him that private companies were practically not their own masters. The basis of all wages was regulated, to a very great extent, by Government establishments, and private companies had to follow the lead, which was very hard on concerns like their own. Bearing in mind all their difficulties, the Company could take a certain pride that the Directors were able to place before the shareholders so satisfactory a report. Considering the extra cost of materials and the increased wages they had paid, the increased price of gas was very moderate indeed. Whether there would be a further increase, it was impossible to say; it entirely depended upon how things turned out. The Chairman then quoted the increases made by numerous other companies, which showed that the price charged at Exeter was low. In conclusion, he paid a high tribute to the excellent work done by Mr. Westlake and the staff.

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Belfast Gas Profits as Rate-Aid.—At the meeting of the Belfast Corporation dealing with the finances and the estimates for the year, the minutes of the Gas Committee were adopted, on the motion of Alderman Craig, allocating, as in previous years, from the gas profits the sum necessary to pay interest and sinking fund on the cost of the new City Hall—viz., £11,400.

Shipley's Maximum Price.—Owing to circumstances of the past, and the addition of the wartime burdens, the Shipley District Council's gas is substantially dearer than that of most Yorkshire gas authorities. Its present price (4s. 2d. per 1000 c.ft.) is the maximum the Council are authorized to charge; and application is being made for power to charge anything up to 6s. 3d.

Breaking Contracts of Service.—Last Friday, at the Dudley Police Court, three stokers employed at the local gas-works were fined 40s. or 21 days, and two others 20s. or 17 days, for breaking their contracts with the Dudley Gas Company. The men, it was alleged, stayed away from their work drinking, with the result that only half the usual quantity of gas was made, and the town had to be put on reduced pressure.

Quality of Gas at Spalding.—A complaint made in church by the Vicar, of the bad quality of the Spalding gas supply, led to the explanation that "this time the failure of the boilers was the cause." They are completely worn out; and though one has been temporarily repaired, it is unsafe to use the other. It is added that, "for the next few weeks, while only one boiler is operating, little or no improvement can be expected in the gas supply."

Tynemouth Gas Bill.—"The Times" is informed by the Parliamentary Agents for the Tynemouth Gas Company (Messrs. R. W. Cooper & Sons) that the decision not to proceed with their Bill for power to increase the maximum price for gas supplied was not due, as had been stated by our contemporary, to the opposition of the local authorities, but to the sudden death of the Company's Chief Officer [Mr. William Hardie], which placed the Directors at great disadvantage in the further promotion of the Bill.

Wages at Bradford.—After consultations with the Ministry of Labour, the Bradford War Wages Committee have reached an arrangement in regard to the 12½ p.ct. award to electrical workers; but in the matter of war bonuses generally in the Corporation service, which is pending arbitration, it was decided to pay forthwith, without prejudice on either side, the bonus rate offered by the Corporation, and in the following week to pay arrears as from Oct. 1. As to the question of whether employees in certified and uncertified departments shall be dealt with by the same arbitration, an agreement was subsequently reached under which the War Wages Committee agreed that the difference shall be determined, as provided by the war wages scheme, on condition that the employees agree to the appointment of an umpire by the Chief Industrial Commissioner's Department, in the event of the local arbitrators failing to agree both on the award and the appointment of an umpire.

Worthing Gas Light and Coke Company.—The accounts for the past half year (as presented at Saturday's meeting of shareholders) were, in present circumstances, "regarded as satisfactory" by the Directors. They point out that the difficulty recently experienced in obtaining a sufficient supply of coal, its increasing cost, and the heavy expenditure on labour and materials, "must affect the operations for the current half year, and is a constant source of anxiety." To meet the situation the price of gas was raised to 4s. per 1000 c.ft. as from the end of last year. The profit and loss account showed a balance of £23,124, out of which the Directors recommended the declaration of the statutory dividend at the rate of 5 p.ct. per annum (less income-tax) upon the consolidated ordinary stock.

"Nationalization of Gas Undertakings."—Some extremist resolutions have been placed on the agenda for the I.L.P. conference at Leicester on April 1 and 2. To wipe out the National Debt, Bermondsey calls for a 5 p.ct. tax on capital over £1000, and a steeply graduated tax on incomes over £250 per annum rising to "18s. in the pound in the case of very large incomes, with the intention of securing the ultimate extinction of all unearned increment." Blantyre insists on the reduction of the National Debt; while Coventry and Burton want a scheme whereby the debt can be wiped out in twenty years by a levy on capital. Burton also demands the nationalization of coal mines, railways, shipping, and gas and electrical undertakings, and a minimum wage of £1 for six-hour working days. Mr. R. Smillie and Mr. Philip Snowden have been nominated for the chairmanship.

Increased Costs of Manufacture at South Shields.—This subject formed a prominent topic in the speech of the Chairman of the South Shields Gas Company (Mr. James Readhead, J.P.) at the annual meeting of shareholders last Tuesday. He also referred sympathetically to the Company's loss by death of Alderman Gillies, one of the Directors, and Mr. J. H. Penney, the late Secretary of the Company. The income was £123,892, and the expenditure £108,533—leaving a profit of £15,359. This was £2259 short of the statutory dividends, notwithstanding the fact that the price of gas had been increased, also that under the operation of the sliding-scale the dividends payable were less than last year. The deficiency and the reduced rates of dividend were, of course, due entirely to the war, which had entailed increased costs for wages, coal, and materials generally, and had also restricted the prices obtained for residuals as fixed by the Government. There had been an increase in the quantity of gas sold as against 1916 of about 6½ p.ct.; but the total quantity of gas sold was less than in the first year of the war, to the extent of 34 millions. The dividends declared were: On the consolidated and new stock of 3 p.ct., making, with the interim dividend, 6¾ p.ct. for the year; and on the ordinary stock 2¼ p.ct., or 4⅞ p.ct. for the year. At the close of the ordinary business an extraordinary meeting was held to consider and approve of the promotion of the Company's Bill in Parliament to extend the limits for the supply of gas, to confer further powers upon them in connection with the undertaking, and for other purposes. The Bill was duly approved.

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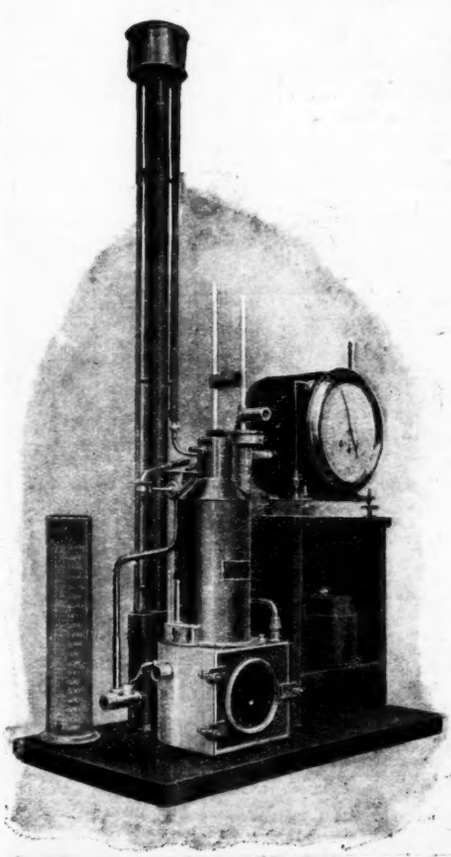

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Gas-Works Inundated.—The Chelmsford Corporation Gas Committee reported that during the recent floods parts of the gas-works were under water. Some inconvenience and concern were caused; but little or no material damage was done. Precautions are, they say, always taken on such occasions to prevent the water from entering certain places and apparatus, which might cause a stoppage of gas-making for a time.

Eight Hour v. Twelve Hour Shifts.—The Southend Corporation have adopted the following report of a Sub-Committee appointed for the purpose of interviewing the stokers at the gas-works in reference to the decrease in the quantity of gas made: The Sub-Committee interviewed the stokers in regard to the recent decrease in the quantity of gas made; and, after a lengthy discussion of the matter, the stokers expressed the opinion that a larger quantity of gas could be produced if they were permitted to work in shifts of two men for eight hours at a time, instead of three men for twelve hours, as at present (which alteration would not entail any increase in the amount of the wages paid per week), inasmuch as their number of absences due to sickness would, in all probability, be less, and they would be better able to carry out their duties. The Sub-Committee resolved to recommend that the alteration in the number of men and hours per shift be adopted, as an experiment, for a period of one month.

Bury Gas-Workers' Demands.—At the last meeting of the Bury Gas Committee, an application on behalf of the men of the department by the Bolton and District Gas-Workers' Association for a 12½ p.ct. war bonus was adjourned until the next meeting.

Larger Consumption at Whitby.—When the proprietors met last Tuesday, the Directors of the Whitby Gas Company, submitting the accounts for the year 1917, reported that the profit and loss (net revenue) account, after charging interest on the debenture stock and deposits, and providing for the interim dividend, showed a balance of £1280, out of which they recommended the payment of dividends at the rate of 3 p.ct. (less income-tax) on the original capital, and of £2 2s. p.ct. (less income-tax) on the additional and new additional capital, for the half year—making, with the interim dividends, 6 p.ct. on the original capital and £4 4s. p.ct. on the additional and new additional capital for the year. This will absorb £918, leaving a balance of £362 to carry forward. The sale of gas for the year showed an increase of 5 million c.ft. (13 p.ct.) over the previous twelve months. Owing to the further increased cost of coal, other materials, and labour, the Directors increased the price of gas 3d. per 1000 c.ft. to all consumers as from Jan. 1. The Directors have installed a crude benzol and tar dehydration plant, which is expected to prove an additional source of revenue.

STOCK MARKET REPORT.

As regards the state of things on the Stock Exchange during the week just completed, it may at least be said that markets in general were not quite so deadly quiescent as they were in the week before. Not that this amounts to much; but, at any rate, it is on the right side of the balance. The tendency in many departments was very fitful and unsettled, shifting and oscillating almost from day to day. But here, again, a crumb of comfort may be picked up in the fact that the clouds were lighter on Friday, and the tone at the close of business was the best of the week.

The gilt-edged market remained for some time a prey to dulness. In Home Government issues, the War Loans continued to be flat; but the ultimate recovery materially reinstated those bearing the lighter rates of interest, and Exchequer Bonds participated. Colonials were consistently steady. Home Rails, after sleeping quietly for some days, woke up before the close, and had a bright finish. The low quotations, emphasized by *ex div.* deductions, were too attractive to be neglected. The American and Canadian group were not prominent. Argentines were long upset by renewed strike alarms, but steadied on satisfactory traffics.

In the Foreign Market, there were but few strong points. French dragged heavily, Japanese moved irregularly, Scandinavians eased, Brazilians were propped up by Exchange, and Russians at times arrested their facile descent. Among the Miscellaneous, Oil was fairly firm; but Rubber was dull. Shipping, Breweries, and Banks were out of favour.

Business in the Gas Market exhibited a further shrinkage in point of volume, and not more than half-a-score of companies were dealt in at all. Of these, too, a goodly percentage had but a single transaction. The quiescence seemed to impair the firmness which has for some time past consistently characterized the market, and some high-class issues changed hands on easier terms. A large number—twenty-seven in all—of quotations underwent variation; but nearly all were the result of *ex div.* adjustments. The Money Market was easy. The 6 p.ct. redeemable mortgages recently offered by the Tottenham District Light, Heat, and Power Company were substantially over-subscribed.

Bargains done for cash during the week were as follows: On Monday, Brentford "A" 77½, 78, Cape Town 3½, ditto debenture 60½, 60½, Gas Light ordinary 66, 66½, 67, 67½, Imperial Continental 88½, 89, 89½, Primitiva 36s. 3d., South Metropolitan 71½, 72. On Tuesday, Gas Light ordinary 66, ditto preference 69½, 70, Imperial Continental 88½, Metropolitan of Melbourne bonds 100½, 100$\frac{7}{16}$, South Metropolitan 71½, 71¾, ditto debenture 54½, 54¾, 55. On Wednesday, Gas Light ordinary 63, 63½, 64, 65, 65¼, 65½, ditto preference 69⅞, 70, Imperial Continental 88, South Metropolitan 72½, ditto debenture 55⅝. On Thursday, Cape Town 3½, European 9½, Gas Light ordinary 63½, 63¼, 63½, 63¾, 64, 64¼, ditto maximum 56, ditto preference 70, Imperial Continental 88¼, 88½, Monte Video 8½, South Metropolitan 72. On Friday, Bombay 5, Gas Light ordinary 63½, 63⅝, 63¾, 64, 64½, ditto maximum 55½, Primitiva preference 55s., South Metropolitan preference 94, ditto debenture 55¾, 56.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60*	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	52—57	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	3/6	Bombay, Ltd.	5⅞—6⅜	5—5½	5
50,000	10	Feb. 26	16	18%	Bournemouth Gas and Water { 10 p.c.	29—30	22—24*	..
383,110	10	,,	7	7%	B 7 p.c.	15—15½	10¼—10⅝*	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9—9¼*	..
159,740	—	—	—	4%	4 p.c. Deb.	..	67—69	..
992,045	Stk.	Feb. 26	14	4½%	Brentford A Consolid.	261—266	76—79	77½—78
734,920	,,	,,	11	4½%	Do. B New	204—209	73—76	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	79—84	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	68—65	..
217,880	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	145—150	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	98—103	..
580,000	20	Mar. 26	12½	22/6	British	44—45	32—33	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	51—54	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	3¼—3⅝	3½
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	6½—7½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	60½—60½
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,513,280	,,	Feb. 12	5/9/4	41/4	Commercial 4 p.c. Stk.	106—108	68—70*	..
560,000	,,	,,	5⅝	36/8	Do. 3½ p.c. do.	103—105	62—64*	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	61—63	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c..	..	165—175*	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	9—10	9½
16,298,975	Stk.	Feb. 10	4/17/4	37/4	Gas Light and Coke { 4 p.c. Ord.	98—102	62—65	63—67½
2,600,000	,,	,,	3½	3½%	3½ p.c. max.	76—79	55—57	55½—56
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	69—71	69½—70
4,674,850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	55—57	..
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
258,740	,,	Mar. 12	5	3½%	Hastings & St. L. 3½ p.c.	87—89	48—53	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	7¾—8½	..
26,600	—	—	—	9½%	Hornsey 7 p.c..	..	115—125*	..
131,000	Stk.	Mar. 12	7⅞	7%	Ilford A and C.	151—154	92—97	..
65,780	,,	,,	6⅝	5¾%	Do. B	115—118	72—77	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	63—66	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	88—90	88—89½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	64—66	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	82—84	..
					{ B	146—148		
306,093	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—73	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	3⅝—3⅞	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	89—100	100½—100$\frac{7}{16}$
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8—8½	8½
1,875,892	Stk.	July 29	4½	3½%	Newcastle&Gatsh'dCon.	98½—99½	77—79*	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	60—62	..
55,940	10	Feb. 26	7/14/0	7/0	North Middlesex 7 p.c.	14—15	9½—10½	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	103—105	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	2—3	..
60,000	50	Feb. 26	13	10%	Portsea, Island B	128—131	82—87*	..
100,000	50	,,	12	9%	Do. C	118—121	72—77*	..
52,000	50	,,	10	7%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅜—2	36/3
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4¾—5	2⅜—3	55/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	76—78	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	57—62	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7½—8	..
125,000	50	July 1	5	5%	{ 5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	222—224	178—181	..
523,500	,,	,,	10	10%	Do. C	220—222	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	9—10	..
6,609,895	Stk.	Feb. 10	5/4/0	40/3	South Met. 4 p.c. Ord.	111—113	71—73	71½—72½
—	—	—	—	—	Do. Pref.	..	93—95	94
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	54½—56
224,920	,,	Feb. 26	8½	6%	South Shields Con. Stk.	157—159	137—139	..
952,795	,,	,,	6	4½%	S'th Suburb'n Ord. 5 p.c.	114—116	73—75*	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	73—75*	..
135,000	—	—	—	4½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	84—86	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	75—77	..
120,000	,,	Feb. 12	7½	5½%	Tottenham { A 5 p.c.	135—138	90—95*	..
782,375	,,	,,	6	4%	District { B 3½ p.c.	115—117	69—71*	..
181,255	,,	June 26	4	4%	{ 4 p.c. Deb.	87—89	61—63	..
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—3	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
286,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	103½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Feb. 26	8⅜	72/6	Wandsworth A 5 p.c..	151—156	108—113*	..
255,636	,,	,,	6⅞	57/6	Do. B 3½ p.c.	129—134	90—95*	..
108,075	,,	,,	5/17/3	50/9	Do. C 3½ p.c.	110—115	82—87*	..
352,900	,,	,,	6½	51/3	Wimbledon 5 p.c.	117—123	82—87*	..
98,000	,,	,,	6⅛	57/6	Epsom 5 p.c.	131—136	91—96*	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	49—52	..

* Ex Div.

Chemical Engineering Company, Ltd.—Mr. C. S. Owston, who has joined the Board of the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., is a Director of Messrs. Thomas Green and Son, Ltd., of Leeds. His father was at one time a Managing-Director of the Chemical Engineering Company.

Ilkley Gas-Workers' Strike.—Efforts are now being made to settle the strike of municipal workers at Ilkley (in which the gas workers are most conspicuously concerned) by arbitration. In the meantime, the strikers continue to indulge in little "incidents" in the hope of handicapping the progress of the very excellent voluntary services which are being maintained. At the Otley Police Court on Friday, seven of the strikers were charged with various offences. One was William Weedon, a gas worker, who was fined 10s. and costs for assaulting one of the two women street cleaners who have started work since the strike began. Weedon and five others were fined 8s. and 2s. costs each for obstructing the highway by upsetting a cart carrying coal. A third charge of violent conduct and using abusive language was withdrawn on payment of costs.

South Suburban Gas Company's Staff and Exemption.—Before the Metropolitan Asylums Board section of the Appeal Tribunal on Thursday last, the National Service Representative for Lewisham appealed against the grant of conditional exemption to Robert J. Fowler (29) and Charles Ashley (31), ledger clerks in the employ of the South Suburban Gas Company. Both men are classified "B2," after having been in Class "A." Mr. Wilfred Wastell, the Secretary of the Company, said that while the men were in Class "A" their M.A.R.O. certificates were withdrawn, and application to the Tribunal became necessary. He believed that it might now be possible to obtain certificates for them. The Chairman (Mr. E. Forbes Lankester, K.C.) said the Tribunal would adjourn the cases for four weeks, in order that the facts might be laid before the proper authority. If protection certificates were not granted, the Tribunal would have the greatest difficulty in continuing the exemption.

Wellington (Salop) Gas Company.—In the report submitted at the recent meeting of this Company it was stated that the revenue last year was £13,055, and the expenditure £10,011, leaving a surplus of £3044. There had been an increase in the sale of gas over 1916 of 9¾ p.ct.; and during the past few months the increase had been as high as 15 p.ct. The Directors recorded the death of the late Chairman, Mr. Harry Shepard, who had occupied this position for twenty years. Mr. C. W. Leake had been appointed in his stead. Mr. R. J. Milbourne, in the course of the proceedings, said this was the first occasion on which they had had to speak in tones of anxiety in regard to the gas-works. A gas undertaking was a particular form of industrial activity as a rule not disturbed by circumstances such as those which exist at the present time. They had passed through difficult times, and might have difficulties in the future; but the financial stability of the Wellington Company was most gratifying. With regard to sulphate of ammonia, they had done particularly well; and now agriculturists recognized the value of it. The coal reserves of the country had been greatly depleted during the year; and attention had been directed to formulating economic supplies in connection with electrical energy. It was impossible at present to foresee to what extent this action would affect gas companies throughout the country. There was the question of gas replacing petrol and many other possibilities open to them in future; and the motor would probably become a valuable consumer. The dividend recommended of £5 10s. p.ct. per annum (less tax) was declared, making, with the interim dividend paid last September, £5 7s. 6d. p.ct. for the year. At the close of the proceedings attention was called to the efficient manner in which Mr. H. J. Woodfine (the Manager) had discharged his responsible duties.

Maximum Price Question at Gainsborough.—A Local Government Board inquiry has been held at Gainsborough into the Urban District Council's request for power to increase the price of gas from 4s. to 5s. per 1000 c.ft. Mr. J. Baldwin (the Gas Manager) said that last year there was a net loss of £1398 on the undertaking. This year he estimated the loss would be £500. Though the Council were asking for the maximum price of 5s., he thought 4s. 6d. per 1000 c.ft. would see them through their difficulties. He attributed the losses to the increased price of coal, increased wages, loss of rentals, and falling prices of certain residuals. Mr. Barlow (the Chairman of the Gas Committee) said a temporary expedient only was intended; the Council hoping to return to normal prices after the war. The full increase would not be charged at once.

Additions to Salaries and War Bonuses at Edinburgh.—At a meeting last week of the Edinburgh and Leith Gas Commissioners, it was decided, on the recommendation of a Sub-Committee, to increase, as from Jan. 1, the amounts of the bonus to the clerical and administrative staffs in the Engineer's and the Treasurer's departments, whose salaries do not exceed £200 per annum, to 13s. 6d. per week. It was further agreed to increase, as from May 15 last, the remuneration of the Engineer and Manager (Mr. Alexander Masterton) by £100 per annum, and that of the Treasurer (Mr. A. Canning Williams) by £50. The subject of soldiers' pay and allowances to dependants was also considered; and it was decided to follow the same rule as that recently adopted by the Edinburgh Town Council—viz., to make up the difference between Army pay and allowances on the new scale, and the amount of the Corporation pay with the addition of 7s. to married men and men with dependants; but that, in fixing the active service allowance, no account should be taken of the new "war pay" authorized by Royal Warrants.

The Directors of the British Gas Light Company will propose to the shareholders, at the half-yearly general meeting later in this month, that a dividend at the rate of 10 p.ct. per annum, with a bonus of 2s. 6d. per share, be paid for the half year ended Dec. 31, both less income-tax, and payable in April.

A verdict of "Suicide by suffocating herself with gas while of unsound mind" was returned at a recent inquest at Otley on Annie Watkinson (36), who was found in bed with a tube attached to the gas-bracket in her mouth. She had been a deaconess at Portsmouth; but returned home in October last owing to ill-health.

"Death as the result of gas-poisoning" was the verdict at a Coroner's inquest at Belfast, on the body of Joseph Totten, who was found lying in the kitchen of his house; the gas-jet being turned on, and the apartment full of gas. It was thought deceased had fallen in an epileptic fit; and that he might have touched the jet, and turned it on accidentally, as he fell.

A verdict of accidental death was returned by a Belfast Coroner's Jury in the case of Edward Barrett, aged 65, who had been found dead in bed with gas escaping from a jet near by. Sergeant Tanner, of the Royal Irish Constabulary, said the jet was very loose, and responded to the slightest touch. Dr. Wadsworth certified that the fatality resulted from gas poisoning acting on a delicate constitution.

The balance-sheet of the Altrincham Gas Company for the year 1917 shows a profit of £10,260. The full statutory dividends have been paid; and a balance of £4099 is carried forward. During the year the sales of gas increased by 21 millions. Dr. W. A. Renshaw, one of the Directors, who died recently, has been succeeded by Mr. J. E. Lamb, whose appointment as Managing-Director of the Company, after thirty-four years' service as Manager, is announced.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER. Haslingden Union Gas Company. Applications by March 7.

WORKS MANAGER. Bolton Gas Department. Applications by March 12.

CHEMIST-ENGINEER. No. 616, c/o "Yorkshire Post," Hull.

CHEMIST. Sunderland Gas Company.

DRAUGHTSMAN. Bolton Gas Department. Applications by March 12.

CHEMIST. No. 6422.

MECHANIC. Weston-super-Mare Gas-Works.

WATER WORKS SUPERINTENDENT. Calcutta Corporation. Applications by May 1.

Appointments, &c., Wanted.

OFFICE WORK OR TRAVELLING (Fire-Clay Trade). No. 6419.

MANAGER OR MANAGER AND SECRETARY. No. 6389.

Plant, &c. (Second-Hand) for Sale.

MOUTHPIECES, ASCENSION PIPES, &c. No. 6420.

STEAM ENGINE AND GAS COMPRESSORS. Birmingham Gas Department.

PURIFIERS, EXHAUSTER, &c. Herne Bay Gas-Works.

Plant, &c. (Second-Hand) Wanted.

GASHOLDER. Chertsey Gas-Works.

BLUE WATER GAS PLANT. No. 6421.

TENDERS FOR

Fire-Clay Goods.

BRIGHOUSE CORPORATION. Tenders by March 15.

General Stores (Ironmongery, Oils, Pitch, Paints, Tools, Castings, &c.).

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Meters.

BRIGHOUSE CORPORATION. Tenders by March 15.

Tar (Distilled).

BRENTFORD URBAN DISTRICT COUNCIL. Tenders by March 16.

Tar and Liquor.

COLNE GAS DEPARTMENT. Tenders by March 16.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by March 1.

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CALCULATORS OF GAS CHARGES.—In view of the interest evinced by Gas Undertakings in this Device—which was noticed in the "JOURNAL" for Dec. 4 last, p. 465—Mr. H. GOODFELLOW, of 57, BRIXTON HILL, LONDON, S.W. 2, will be pleased to supply copies (copyright) at 5s. each, post free.

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